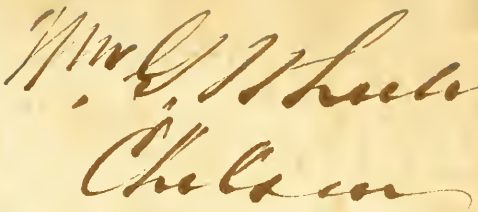
23. E. 128.



Wm. G. Wheeler
Chelsea

A

TREATISE

ON

DISEASES OF THE BONES.

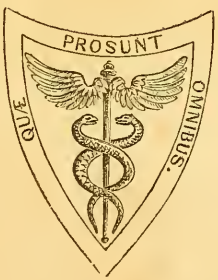
BY

EDWARD STANLEY, F.R.S.

PRESIDENT OF THE ROYAL COLLEGE OF SURGEONS OF ENGLAND,

AND

SURGEON TO ST. BARTHOLOMEW'S HOSPITAL.



PHILADELPHIA:
LEA AND BLANCHARD.
1849.

1697

"Quid dicam de ossibus? quæ subjecta corpori, mirabiles commissuras habent, et ad stabilitatem aptas, et ad artus finiendos accommodatas, et ad motum, et ad omnem corporis actionem."—*Cicero, De Naturâ Deorum*, Lib. sec.

O. S. COOKE & CO., PRINTERS,
WEST BROOKFIELD, MASS.

DEDICATED

TO

JAMES BENTLEY, ESQUIRE,

TREASURER

Of the Royal Hospital of St. Bartholomew,

WHOSE ADMINISTRATION

OF THAT NOBLE INSTITUTION

IN THE SERVICE OF CHARITY AND OF SCIENCE,

IS WORTHY OF ALL PRAISE.

Digitized by the Internet Archive
in 2011 with funding from
Open Knowledge Commons and Harvard Medical School

http://www.archive.org/details/treatiseondiseas00stan

PREFACE.

The admirable Lectures on the Diseases of Bone, with which Mr. Abernethy commenced his Anatomical and Physiological course, first incited me to the study of this subject. Observation, continued with some diligence through many years, and, in a large field of experience, has enabled me to accumulate the materials upon which the present volume is founded. The size of the volume bears no proportion to the number of the facts out of which it is constructed. For in this, as in other scientific investigations, the first object has been to obtain the facts, and the second to interpret them rightly for the conclusions they warrant. This I have endeavored to do, but with the result, I am aware, of leaving some of the morbid phenomena of bone uninterrupted, even unnoticed, for the reason that they were to me unintelligible. And I am induced to submit the work in its incomplete state, rather than detail in it characters of disease from which, in consequence of not understanding them, I should not be able to deduce either pathological conclusions or indications of treatment.

I venture to think that others have experienced the difficulty which I have felt, in the attempt to arrange and explain the subjects to be comprehended in a Treatise on the Diseases of the Bones: otherwise, in an age remarkable for the fulness of its scientific literature, it might be expected that such treatises would have been produced. But the only works possessing this character, of which I have knowledge, are the Treatises of Petit, published in 1705, and of Boyer, in 1803.

The liberal feeling, which happily prevails in our profession, is mani-

fested through the following pages in the use that has been allowed me of the facts which others have observed. My acknowledgments on this head are sincerely offered to my colleagues at St. Bartholomew's Hospital. Especially to Mr. Lawrence these acknowledgments are due. Associated with him for many years, I have largely participated in the benefit he has conferred upon all around him, by the example of his untiring zeal and fidelity of observation, and by the liberality with which he never fails to communicate knowledge to all who are in search of it. I am also desirous of expressing to my able colleagues, Mr. Paget and Dr. Baly, my thanks for assistance in the preparation of this work.

It is necessary to observe, that notwithstanding the references, which will be found in the following pages, to another volume, containing "Illustrations of the Effects of Disease and Injury of the Bones," the two works are, in all other respects, wholly distinct. The volume of Illustrations contains, with the descriptions of the plates, full explanations of the subjects to which they relate, so that, in respect to these subjects, it is a complete and an independent work.

INTRODUCTION.

GENERAL CONSIDERATIONS ON THE DISEASES OF BONE.

It is probable that Jean Louis Petit, in his "Treatise on the Diseases of the Bones," first observed the analogy in their morbid changes to those of the soft parts of the body. Mr. Hunter, adopting the same view of the subject, represents "the bones in the causes of many of their diseases, in the termination of them and in their restoration, as similar to the soft parts."* Mr. Abernethy, following out the same doctrine, referred to the phenomena which bone presents in disease as the proof of its vital organization.† Experience has proved the correctness of these views, and, accordingly, they are made the foundation of the following Treatise.

Although it is true, that the diseases of bone are analogous to those of soft parts, yet they have their peculiar characters; for in bone, as in other tissues, the rule holds that diseases are modified by the structure and vital properties of the part they attack.

Diseases of bone are generally characterized by slowness of progress. And it is equally so, whether the process tends to the advance or the recession of disease. Thus the exfoliation of the smallest piece of dead bone often requires many months for its completion; and a much longer time is required for the osseous union or anchylosis of the surfaces of bone, which, in the progress of disease in the spine, or in a

* Lectures. † Lectures.

large joint, are brought into contact by destruction of the intervening tissues. Again, when the internal organization of a bone is deranged, as in the softening of it from scrofula, even with the help of every strengthening influence upon the constitution, the reparation of the diseased bone is so tedious a process, that too frequently, from impatience in the treatment, sufficient time is not allowed for the bone to become again firm, and thereby fit for its functions.

Bone is one of the less vascular tissues of the body; yet it readily inflames, and as readily throws forth granulations; and in the reparation of its fractures, the osseous tissue itself takes a much larger share in the work of reparation than either the periosteum or medullary membrane. A more interesting view is not exhibited to the unaided sight of the pathologist than that of the changes which ensue upon an exposed living and healthy bone. First, its surface becomes of a faint red or pinkish tint, from the afflux of blood to its vessels; then, bright red dots and streaks appear in the bone, which are the immediate precursors of the granulations from its tissues. These granulations appear as minute conical or round, soft papillæ rising from the bone. When slightly touched, they freely bleed, and evince sensibility. Next, the granulations from the bone coalesce with those from the surrounding parts, and in this way the bone again becomes possessed of a covering of soft tissues.

Bone possesses in its healthy state but little sensibility. But under circumstances of disease, its sensibility often becomes wonderfully exalted. Thus I have witnessed the manifestation of pain as acute from the penetration of an inflamed bone by a saw or trephine as from the incisions of inflamed soft parts. We observe, moreover, the granulations from diseased bone participating in the morbid sensibility of its tissue.

Such being the vital properties of bone, it is very liable to disease; and its diseases are many, when compared with the diseases of muscle, tendon, or nerve, or indeed of any other organ or tissue.

In respect to its original formation, development, and growth, bone is amenable to the same disturbing influences as the soft organs and tissues. Accordingly, there occur in bone congenital defects in out-

ward form, as well as in internal organization; thus, in a child born with vascular hypertrophy, of the character of nævus, extending through the soft parts on one side of the cranium and face, the bones were correspondently affected; they were found to be very thick and spongy, and excessively vascular—they presented the characters of nævus in the osseous tissue.*

Whatever may be the source of the symmetry of diseases in soft parts, its influence extends to the osseous system. Exactly similar morbid conditions are constantly observed in the corresponding bones of the opposite sides of the body; also in the halves of single bones. Thus the two thigh bones are often enlarged, indurated and roughened on their surfaces, in so precisely the same manner and degree that not a morbid character can be pointed out in one of them which has not its fellow in the other; and in the lateral halves of the frontal bone, identical characters of disease are often observed. In animals, the evidences of symmetrical morbid action are even more remarkable than in man. In the museum of the College of Surgeons there is the pelvis of a lion, which belonged to Mr. Hunter, exhibiting on its opposite sides the effects of inflammation in the periosteum so perfectly alike, that not a roughness, eminence, or hollow can be detected on one side which is not exactly repeated on the other. Even the morbid growths from bone have appeared symmetrically; thus there are instances of exostoses growing of the same size and form, and in the same situation, from the corresponding bones on the opposite sides of the body.

It can scarcely be stated that the bones participate in all the disorders of the system, which directly give rise to depravation of the fluids circulating through the soft tissues, and, in consequence, to changes in their component elements. Whatever peculiar immunities from disease the bones evince, are, it may be presumed, owing to the character of their organization, in respect to the earthy constituents so largely entering into their composition. There are, however, instances in which the bones, participating in the general disorders of the system, do undergo changes in their elements, and throw forth morbid products of the same character as those occurring at the time in the softer tissues of the body. Thus in gout, the earthy phosphates in the

* Museum of St. Bartholomew's Hospital, First series, No. 54.

bones have diminished, peculiar products have been thrown forth from them, but they were such as are characteristic of the gouty constitution*.

It is a peculiar feature in the morbid history of bone, that the irritation of disease, however excited in it, is so commonly followed by the action of forming osseous substance among the surrounding soft parts, some of these being more prone to this action than others; hence, the ossification ensuing in the various structures adjacent to diseased, or injured, bones. Here, moreover, it may be well to regard in one view the whole series of ossifications and osseous productions arising either as distinct diseases, or as the consequence of disease in their neighbourhood. Morbid ossifications and osseous productions may be arranged under the following heads:—

1. Unorganized masses of calcareous salts, found in various tumors, especially in the fibrous tumours of the uterus, also constituting the apparent ossifications in the coats of arteries.
2. Ossifications of original tissues, as of fibrous membrane, tendon, muscle, &c. These are, probably, but the ossifications of one tissue, the cellular, a component of all these structures.

Fibrous membranes are remarkably prone to ossification; one example of which, among many, is the long-enduring ulcer upon the leg, followed by ossification of the periosteum beneath the ulcer and around it, accompanied by ossification of the inter-osseous ligament between the tibia and fibula, often converting it into a thick plate of bone. The character of its organization is not the sole cause of the tendency of fibrous membrane to ossify. Its vital properties, and its locality in connexion with the purposes it serves, are also to be taken into account in explanation of the exception that some fibrous membranes, as the muscular aponeuroses, or fasciæ, very rarely ossify. So in respect to the pericranium, which in its structure is not distinguishable from the periosteum of

* Chemical Composition of Concretions from Gouty Bones, Marchand, Journal f. Pract. Chemie. Oct. 1842.

Urate of Soda	34·20
Urate of lime	2·12
Carbonate of lime	7.68
Chloride of sodium	14·12
Water	6·80
Animal substance	32·53
Loss	2·37
	100·0

other bones; yet the ossification of its texture does not occur. Osseous tumors, it is is true, are found upon the cranium, but they have originated in the bone, not in the pericranium.

All these ossifications of original tissues, when completed, exhibit in the miscroscope, in different instances, more or less of the characters of true bone.

3. Growths of perfect bone. Most of these are productions from originally formed bone, but they are not invariably so: some of these growths are found in cellular tissue, and have no connexion with the adjacent bones. The osseous tumours growing from bones are of three kinds: one consists in a circumscribed hypertrophy of the bone from which the tumor grows; this is not preceded by cartilage, it is usually cancellous, and its composition is the same as true bone. Another osseous tumor growing from bone is that which is of most frequent occurrence, the genuine exostosis, which is preceded by the formation of cartilage, and composed of true bone, and is usually a local malady of an innocent nature. The third form of osseous tumor growing from bone includes varieties in respect to its composition and character, and some of these exhibit features of malignancy. One of the most conspicuous of such growths is the Osteoid Tumor of Müller.

Many, and remarkably varied, are the characters of disease in bone; yet it is not to be doubted that each of its morbid changes is the definite character of but one disease. For example, the thickenings, indurations, and ulcerations of bone exhibit various features in correspondence with the variety of the causes producing them. So with respect to the syphilitic worm-eaten ulcer of bone, its characters are so distinct that no other disease can be mistaken for it; but there are varieties in the syphilitic ulcer of bone corresponding, Mr. Paget has observed, with the varieties of the syphilitic eruption and ulcer in soft parts.

Bone holds a high place among the animal structures, in respect of the provision made for its reproduction when lost by injury or disease. If a portion of tendon, or muscle, perishes and sloughs away, no reproduction of it ensues. The portion of bone, on the other hand, which perishes and exfoliates, is, under certain circumstances, replaced. Indeed it may be affirmed, that no where else in the animal body does so perfect an instance of reproduction occur as in certain cases of necro-

sis, where the shaft of a bone with its compact walls, cancellous texture, medullary tube, membrane, and medulla, are all reproduced with every essential feature of their original organization.

Experiments in animals have not accomplished so much for the elucidation of the reparative processes of bone in man as might probably have been expected. The circumstances attendant on the fractured or necrosed bone, in man, are essentially different from those of the experiment of breaking, or causing the death of a bone in animals. Thus, around the fractured bone of an animal, the deposit of cartilaginous and osseous substance, which has been designated provisional callus, is of uniform occurrence. But, in the human subject, no such cartilaginous and osseous deposit uniformly takes place around the fractured bone ; here, therefore, it is not an essential part of the reparative process. Also, with respect to the production of necrosis by experiment in animals, the condition of the surrounding soft parts is so materially different from the condition of these parts preceding and accompanying the death of the shaft of a bone in man, that, in consequence, the features of the reparative process in the two cases are essentially different. It has, therefore, been incorrectly assumed, that because such is the reparative process of fracture, or necrosis, in animals, it must be so likewise in man.

ARRANGEMENT OF THE SUBJECTS.

PART I.

CHAP. I.—Hypertrophy of Bone.
Atrophy of Bone.
II.—Neuralgia of Bone.
III.—Inflammation of Bone.
Enlargement of Bone,
a. By expansion of its Tissue.
b. With induration of its tissue.
c. By Osseous Deposits on its Surface.
IV.—Suppuration in Bone.
V.—Caries.
VI.—Ulceration of Bone.
VII.—Death of Bone: Necrosis.

PART II.

Tumors of Bone.
a. Tumors of Bone which pulsate.
b. Osseous Growths arising in considerable numbers from the Skeleton, and in the Soft Tissues.

PART III.

CHAP. I.—Rickets.
II.—Conditions of Bone designated Mollities and Fragilitas Ossium.
III.—Scrofula in bone.
IV.—Hard Carcinoma, Melanosis in Bone.

PART IV.

CHAP. I.—Morbid Growths from the Jaws.
II.—Diseases of the Bones of the Spine.
III.—Diseases of Periosteum.

CONTENTS.

INTRODUCTION.

PAGE

Analogy in the diseases of bone to those of soft parts vii
Diseases of bone of slow progress vii
Vascular character of bone, its liability to inflammation, phenomena of its granulating process viii
Sensibility of bone, its exaltation by disease viii
Many diseases of bone by comparison with other organs and tissues . . viii
Congenital defects of the outward form and internal organization, nævus in bone viii
Symmetrical morbid actions in bone ix
Peculiar immunities from disease in bone, owing to its earthy constituents . ix
Morbid ossifications and osseous productions, the consequence of the irritation of disease in bone x
Arrangement of morbid ossifications and osseous productions x
Great variety in the characters of disease in bone; every disease in bone its definite character xi
Bone compared with other structures, in respect to the provisions for its reproduction xi
Experiments in animals, failure to illustrate the reparative processes of bone in man xii

PART I.

CHAPTER I.

HYPERTROPHY AND ATROPHY OF BONE.

Hypertrophy of bone 25
Examples of hypertrophy 25
Influence of remedies on hypertrophy 27
Hypertrophy of the bones of the face 27
Hypertrophy of the bones of the lower extremity, consequences of it . . 28
Circumscribed hypertrophy simulating exostosis 28
Atrophy of bone 29
Causes of atrophy 29
Atrophy with defective growth 30
Defective growth of bone from disease 30
Defective growth in bones of the lower extremity, its consequences . . 30

CHAPTER II.

NEURALGIA OF BONE.

PAGE
History of the affection 32
Neuralgia simulating inflammation, abscess in bone 32
Diagnosis between neuralgia and inflammation of bone 32
Examples of neuralgia of bone 33

CHAPTER III.

INFLAMMATION OF BONE.

Vascularity, sensibility of inflamed bone 37
Morbid products from inflamed bone 37
Reciprocal actions of disease in bone, periosteum, and medullary membrane . 38
Enlargement of bone by expansion of its tissue 38
Characters of expanded bone 38
Enlargement of bone, with induration of its tissue 39
Characters of indurated bone 39
Causes of induration of bone , ... 40
Changes in the articular ends of bone from rheumatism 41
Influence of medicines upon induration of bone 41
Enlargement of bone by osseous deposits on its surface 41
Rheumatic inflammation of periosteum the frequent cause of these deposits . 42
Difficulty in the diagnosis of the various enlargements of bone . . . 42
Enlargement of the cranial bones not the effect of ossification of the pericranium 43
Nervous affections coincident with enlargements of the bones of the skull . 43
Epilepsy, insanity, tic doloureaux—their connexion with enlargements of the bones of the skull 43
General considerations on the treatment of inflammation of bone . . 44
Principles of treating inflammation of bone 44
Remedies for inflammation of bone 44
Local remedies 44
Internal remedies, iodide of potassium, its efficacy 44
Influence of iodide of potassium on the syphilitic affections of bone . . 45
Influence of mercury upon the acute affections of bone 45
Counter-irritation, its influence upon the painful enlargements of bone . . 46
Considerations regulating the use of counter-irritation 46

CHAPTER IV.

SUPPURATION IN BONE.

Abscess in bone, its distinction into circumscribed and diffused . . . 48
Character of the circumscribed abscess 48
Circumscribed abscess preceded by tubercle in bone 48

PAGE
Circumscribed abscess, mode of its enlargement 50
Diffuse suppuration in bone, its formidable character 50
Causes of diffuse suppuration in bone, example of it after amputation . . 50
Diffuse suppuration in bone, its combination with suppuration in veins, purulent deposits in distant parts 51
Obscurity in the symptoms of diffuse suppuration in bone, how arising, example of it in the humerus 51
Diffuse suppuration in bone accompanied by necrosis, example of it in the tibia . 52
Cases illustrating the history of inflammation in the medullary membrane . 53
Diagnosis of abscess in bone 55
Treatment of suppuration in bone 57
Consideration of the measure of perforating the bone for the discharge of matter from it 57
Mode of perforating a bone 58
Consideration of the perforation of the outer table of the skull, for the discharge of matter from its diploe 59
Combination of suppuration in the diploe, with necrosis of the outer table of the skull 59

CHAPTER V.

ON CARIES.

Definitions of caries 61
Varieties of caries 61
Phenomena of caries 61
Diagnosis of caries 62
Treatment of caries 63
Influence of depletory remedies on caries 63
Natural processes of cure of caries, considerations respecting the operation of removing carious bone 63
Incisions of the soft parts covering carious bone—effect of local applications to it 64
Instances of caries unsuited for operation 65

CHAPTER VI.

ULCERATION OF BONE.

Ulceration of bone analagous to ulceration of soft parts 67
Varieties of ulcer in bone 67
Characters of ulcerated bone 68
Ulceration of bone, a primary disease in the vertebræ, in the articular surfaces of bone 68
History of ulceration of the head of the femur 69
Ulceration of the articular surfaces of bones in the progress of the inflammatory disease of joints, its characters and consequences 69
Reparation of ulcerated bone 70
Reproduction of the cancellous substance of bone removed by ulceration—osseous anchylosis 70

PAGE

Reproduction of the compact substance of bone removed by ulceration . . 70
Treatment of ulceration of bone 70
Local remedies applicable to ulcerated bone 70
Influence of counter-irritation on ulcerated bone 71
Phagedenic ulceration of bone 71
History of the disease, examples of it 71

CHAPTER VII.

NECROSIS.

Definition of necrosis, modes of its occurrence 74
Characters of dead bone 74
Comparative frequency of necrosis in the cancellous and compact tissue of bone 74
Liability of different bones to necrosis 75
Peuliar tendency in the head of the tibia to disease 75
Causes of necrosis 75
Removal of periosteum—consequent death of the outer lamellæ of the bone . 75
Necrosis of the upper or lower jaw, how usually arising 76
Necrosis of the lower jaw from scurvy, from excessive salivation . . . 76
Necrosis of the jaws in lucifer-match manufacturers 76
Disease in the bones of cows, apparently from the influence of the fumes of arsenic 79
Necrosis of tuber ischii, trochanter major, from pressure 80
Necrosis of scrofulous bone 80
Necrosis consequent on syphilis 80
Necrosis from rheumatic inflammation of periosteum—examples of it in the trochanter major 80
Consideration of the fistulous passage in the soft parts as a character of necrosis 81
Symptoms of necrosis 82
Characters of necrosis of the outer lamellæ of a bone 83
Characters of necrosis of the inner lamellæ of a bone 82
Characters of necrosis of the shaft of a bone in its whole thickness , . 83
Question of the death of the medullary tissue from necrosis of the walls of a bone 84
Necrosis near the articular end of a bone—extension of inflammation to the adjacent joint 84
Mildness of the inflammatory changes in the soft parts around a dead bone, under what circumstances observed 84
History of necrosis in the head of the tibia 85
Mode of separation of dead from living bone 86
Analogy of exfoliation to the separation of a slough from soft parts . . 86
Phenomena of exfoliation, observed in man and in animals . . . 87
Analogy of exfoliation to the shedding of the antlers in deer . . . 87
First investigation of exfoliation as a vital process, by Hunter . . . 88
Investigation of exfoliation by the microscope 88
Chemical qualities of the pus from parts adjacent to exfoliating bone . . 89
Mode of removal of dead bone 89
Disappearance of dead bone without sensible exfoliation, examples of it . . 90
Agency of granulations in removing dead bone 90
Removal of dead bone in particles, by a process designated insensible exfoliation 90

PAGE
Size of an exfoliated piece of bone in relation to the space in the living bone . 91
Pulsatile movement in the matter adjacent to exfoliating bone . . . 91
Extrusion of exfoliated bone, how effected 91
Question of the removal of exfoliated bone by the living parts . . . 91
Adhesion of the living parts to dead bone 92
Exfoliation an uncertain process 93
Reparative processes consequent on necrosis 93
Question of reproduction of the outer lamellæ of a bone . . . 94
Phenomena consequent on the death of the outer lamellæ of bones in animals —experiments of Hunter 95
Removal of the entire periosteum of the shaft of a bone in animals—the reparative process 95
Activity of the reproductive power possessed by medullary tissue . . 96
Necrosis of the walls of a bone—reproduction by the periosteum . . 96
Necrosis of the inner lamellæ of a bone—the reproductive process , . 96
Necrosis of the entire inner lamellæ of a bone—separation in the form of a tube 96
Necrosis of the entire thickness and circumference of the shaft of a bone—the reproductive process 97
Reproduction by periosteum considered 97
Question of reproduction by portions of the old bone separated with the periosteum 100
Reproduction from the articular ends of the original bone . . . 101
Question of reproduction by the surrounding soft parts 101
Periosteum of the new bone, how formed 102
Holes in the walls of the new bone, how arising, consequences of them . 102
Composition of the new bone 103
Detachment of the articular ends of the original bone before the new bone has acquired firmness, consequences 103
Uncertainty in the time required for reproduction of the shaft of a bone . 104
Cases of necrosis most favourable for the reproductive process . . . 104
Cases of necrosis not followed by any reproductive process . . . 105
Necrosis of flat bones—question of their reproduction 105
Necrosis of the ilium—its consequences 105
Question of reproduction of short cylindrical, irregularly-shaped bones . . 106
Instances of necrosis followed by no change in the dead bone and by the closure of the fistulous passage leading to it 106
Productions of new bone adherent to dead bone—question of the mode in which this happens 107
References to least frequent examples of necrosis 108
Treatment of necrosis 108
Applications to the soft parts around dead bone 108
Applications to the dead bone 109
Superficial necrosis—removal of the dead bone by operation . . . 110
Deep-seated necrosis—removal of the dead bone by operation . . . 110
Mode of extracting dead bone 110
Treatment of necrosis of the shaft of a bone 111
Question of the removal of the dead shaft of a bone 113
Necrosis within the head of the tibia—question of the removal of the dead bone 114
Necrosis of the shaft of the tibia—removal of the dead bone . . . 114
Necrosis of the humerus—removal of the dead bone 115
Necrosis of the lower part of the femur—removal of the dead bone . . 116
Treatment of necrosis of the bone of a finger or toe 116
Illustrations of operative proceedings for the removal of dead bone . . 117

PART II.

TUMORS OF BONE.

	PAGE
Characters of the morbid growths from bone	125
Arrangement of the tumors of bone	125
Principal products found in the tumours of bone	126
Tumour of bone composed chiefly of cartilaginous substance	127
Two forms of the cartilaginous tumor	127
Characters of the cartilaginous tumor	127
Diagnosis of the cartilaginous tumor	128
Progress of the cartilaginous tumor to a large size, changes in it	129
Influence of remedies upon the cartilaginous tumor	129
Cartilaginous substance combined with other morbid products	130
Tumor of bone composed chiefly of osseous substance	130
Exostosis, composition	130
Mode of formation and growth—primordial cartilage	131
Varieties of exostosis	132
Distinction between exostosis and enchondroma	132
Figure—size of exostoses	132
Many exostoses in the same individual	133
Diagnosis of exostosis	133
Exostosis from the bone of a finger or toe	133
Consequences of exostoses	134
Exostosis from the bone of a toe—its characters, consequences	135
Treatment of exostosis	136
Removal of exostoses by operation	136
Mode of removing exostosis from the last bone of a toe	137
Exostosis from the femur close to the knee-joint, its removal by operation	138
Removal of hard exostoses	140
Spontaneous separation of exostoses	140
Suppuration within an exostosis	140
Malignant osseous (osteoid) tumor	140
Characters of the malignant osseous tumor	141
Instances of the malignant osseous tumor	142
Tumor of bone composed chiefly of encephaloid substance	145
Characters and progress of the encephaloid tumor	145
Diagnosis of the encephaloid tumor	148
Question of amputating a limb, the seat of the encephaloid tumor of bone	149
Tumor of bone, composed chiefly of fibrous tissue	150
Characters of the fibrous tumor	151
Diagnosis of the fibrous tumor	152
Tumor of bone, composed chiefly of gelatinous substance	153
Characters of the gelatinous tumor	153
Tumor of bone, composed chiefly of fatty substance	154
Characters of this tumor	154
Tumor of bone, composed of a soft substance, of the character of erectile tissue	155

PAGE
Characters of this tumor 155
Tumor of bone composed chiefly of blood 156
Characters and progress of this tumor 156
Question of the sanguineous tumor being a variety of encephaloid disease . 157
Tumor of bone consequent on the production of entozoa within it . . 158
Characters and progress of the hydatid tumor of bone 158
Diagnosis of this tumor 159
Treatment of hydatids in bone 161
Tumor of bone consequent on the formation of membranous cysts within it . 162
Characters of this tumor 162
General considerations relative to the diagnosis and prognosis of the tumors of bone 162
Tumors composed of soft substance, yet incompressible 163
Tumors having the hardness of bone 163
Tumors so soft as to be readily compressible 163
Degree of fixedness of the tumor, as evidence of its connexion with the bone . 164
Enlargement and tortuosity of the veins ramifying over the tumor . . 164
Condition of the absorbent glands adjacent to the tumor 164
Anomalous character produced in the tumor by the flow of blood into it from an ulcerated artery 164
Displacement of blood-vessels by the tumor 165
Tumors of bone which pulsate 166
Varieties of pulsating tumor 166
Sources of pulsation 167
Treatment of the pulsating tumor 170
Examples of the result of treatment 170
Difficulties in the diagnosis of the pulsating tumor 172
Pulsating tumors arising from many bones 173
Osseous growths in considerable numbers from the skeleton and in the soft tissues 174

PART III.

CHAPTER I.

RICKETS.

Characters of the disease 179
Usual period of its appearance 179
Condition of rickety bones 179
Figure of rickety bones 180
Condition of the skull 181
Condition of the spine, its distortions 182
Distortion of the chest 183
Changes in the form of the pelvis 183
Condition of the thigh bones 184
Arrest of growth in rickety bones 184
Distortions of the joints 184
Question of the progressive changes in the bones from the lower to the higher parts of the skeleton 185

PAGE
Reparation of rickety bones 186
Causes of rickets 187
Co-existence of rickets with tubercle in the lung 187
Treatment of rickets 188

CHAPTER II.

MOLLITIES AND FRAGILITAS OSSIUM.

Histories of cases in which the bones were softened 190
Histories of cases in which the bones were thinned in their walls, giving rise to spontaneous fractures 193
Examples of this condition 195

CHAPTER III.

SCROFULA IN BONE.

Forms of scrofulous disease in joints 199
Changes in bone from scrofula 200
Question of the curability of scrofulous bone 200
Question of the reproduction of bone destroyed by scrofula . . . 201
Question of the co-existence of tubercle in bone with its deposit in the lungs . 201
Changes from scrofula occurring in many bones 202
Treatment of scrofula in bone 202
Length of time required for the cure of scrofula in bone . . . 203

CHAPTER IV.

HARD CARCINOMA AND MELANOSIS IN BONE.

Characters and progress of carcinoma in bone 205
Melanosis in bone 208

PART IV.

CHAPTER I.

MORBID GROWTHS FROM THE JAWS.

Disease of the gum designated epulis 211
Characters, progress of this disease 211
Disease originating in the gum, &c.. designated epithelial cancer . . 212
Characters and progress of this disease 213
Treatment of epulis and of epithelial cancer 213
Question of the removal of epithelial cancer co-existing, with enlargement of the absorbent glands 214

PAGE

Morbid growths from the lower jaw 216
Varieties of morbid growth from the lower jaw 216
Characters, progress of morbid growths from the lower jaw . . . 218
Operations upon the lower jaw 220
Various directions of the incisions in the soft parts 220
Steps of the operation of removing a portion of the lower jaw . . . 221
Removal of the alveolar border of the jaw 221
Consequences of removing the front of the lower jaw 222
Means of remedying these 222
Removal of the ramus of the jaw 222
Retraction of the tongue following the removal of the front of the jaw . 223
Reproductive power ensuing upon the removal of part of the lower jaw . 224
Removal of both lateral portions of the jaw, leaving the symphisis . . 224
Morbid growths from the upper jaw 224
Particulars in the anatomy of the antrum 225
Lines of connexion of the superior maxillary with the adjacent bones . . 226
Explanation of the frequent origin of morbid growths in the antrum . . 226
Morbid growths in the antrum, periods of their occurrence . . . 227
Varieties of morbid growth from the superior maxillary bone . . . 227
Malignant ulceration of the walls of the antrum unaccompanied by morbid deposit 228
Epulis extending into the antrum 228
Diagnosis of enlargements of the antrum 228
Progress of tumors in the antrum 229
Mode of investigating tumors of the antrum 230
Question of operation, on what it rests 231
Operations upon the superior maxillary bone 231
Mode of extracting a morbid growth from the antrum 232
Removal of the superior maxillary bone 232
Considerations on the question of removing part, or the whole of the superior maxillary bone 233
Disease limited to the nasal portion of the maxillary bone, mode of its removal 234
Mode of removing the entire maxillary bone 234
Consequences of the removal of the maxillary bone, means of remedying these 236
Instance of hypertrophy of the superior maxillary bone, operation of its removal 237
Membranous cysts connected with the alveolar process of the upper jaw . 239
Characters, progress of the disease 239
Treatment of it 240
Treatment of accumulations of fluid within the antrum . . . 241
Treatment of suppuration in the antrum 241

CHAPTER II.

DISEASES OF THE BONES OF THE SPINE.

Varieties in the diseases of the spine 243
Structural changes from inflammation in the spine 243
Most frequent causes of inflammation in the coverings of the spine . . 243
Suppuration beneath the coverings of the spine 243
Inflammation in the bone of the spine occurring in the course of fever . . 244

PAGE
Suppuration into the cancellous texture of the vertebræ . . . 245
Ulceration of the bones of the spine, its frequency 245
Examples of ulceration of the vertebræ from injury 245
Symptoms, progress, and consequences of ulceration of the vertebræ . . 246
To what extent is ulceration of the vertebræ reparable 246
Disease commencing in the inter-vertebral fibro-cartilages . . . 247
Scrofulous disease in the bones of the spine 247
Characters and progress of this disease 247
Distortions of the spine ensuing from disease of the bones and fibro-cartilages . 248
Consequence of the destruction of the bodies of the vertebræ . . . 249
Consequence of the destruction of the arches of the vertebræ . . . 249
Irregularities in the spinous processes from original formations . . . 249
Destruction of the bodies of the cervical vertebræ, the consequent distortion . 249
Destruction of the bodies of the dorsal vertebræ, the consequent distortion . 250
Destruction of the bodies of the lumbar vertebræ, the consequent distortion . 250
Destruction of the inter-vertebral fibro-cartilages, the consequent distortion . 250
General remarks on the symptoms of disease in the spine . . . 250
Question of pain in the spine being the evidence of disease in it . . 250
Symptoms of affection of the spinal cord and nerves, ensuing from disease in the spine 252
Treatment of disease in the spine 253
Rule of treatment applicable to all diseases of the spine . . . 253
Local depletion, question of its use 253
Consideration of the use of mercury 254
Treatment of inflammation of the investments of the spine presumed to be rheumatic 255
Treatment of paraplegic affections presumed to have been of inflammatory origin 255
Question of the utility of counter-irritation in disease of the spine . . 256
Slow progress of the reparative processes ensuing upon disease of the spine . 258
Caution in deciding upon the condition of a spine which has been the seat of disease 259
Psoas abscess 259
Seat of psoas abscess 259
Occasionally unaccompanied by disease of the spine 259
Effect of the psoas abscess upon the spinal cord 260
Varieties in the progress of psoas abscess 260
Psoas abscess in the thigh simulating adipose tumor 260
History of iliac abscess, distinctions between it and psoas abscess . . 261
Treatment of psoas abscess 263
Diseases in the first and second cervical vertebræ 266
Malignant diseases of the spine 267

CHAPTER III.

DISEASES OF PERIOSTEUM.

Causes, effects of inflammation of periosteum 270
Inflammation of periosteum from syphilis, its effects 270
Inflammation of periosteum from scrofula, various changes to which it gives rise 271

PAGE

Inflammation of periosteum near a joint, consequences of it . . . 273
Inflammation of the periosteum of the pelvis, mistaken for disease in the hip-joint 273
Examples of this disease 273
Inflammation of the periosteum of the trochanter major of the femur . . 274
Treatment of inflammation of periosteum 275
Incision of inflamed periosteum 277
Illustration of varieties of periostitis 278
Malignant disease of periosteum 281
Characters, progress of the disease 281
Grounds of the opinion of its malignancy 281
Examples of this disease 282
Diagnosis of it 286

PART I.

CHAPTER I.

HYPERTROPHY AND ATROPHY OF BONE.

The changes which occur in bone from hypertrophy and atrophy are remarkable in respect to the close connexion they establish between the vital actions in bone and those in the softer tissues. But there is a higher interest in the history of hypertrophy and atrophy of bone, from the practical questions involved in the phenomena to which they give rise.

HYPERTROPHY OF BONE.

This condition of bone consists in an increase of its size from the augmentation of its healthy tissue. Long bones are often thus increased in thickness, but rarely in length. I have, however, seen instances of long bones hypertrophied in their length. In the museum of the university of Bonn I saw the skeleton of a young female, in which the tibia and fibula are hypertrophied in thickness, and in its length to the extent of three inches. When a bone is hypertrophied only in its length, it may seem that the apparently greater length of it is the consequence of defective growth in the corresponding bone of the opposite limb. But when a bone is increased in thickness, and also in its length, its hypertrophied condition is then distinctly marked.

Instances occur of hypertrophy in the tibia, whilst the fibula undergoes no change. Under such circumstances, either the hypertrophied tibia will become curved, or the ligaments uniting it to the fibula will yield with the increase of its length; and I have seen instances of both these occurrences.

The following are examples of hypertrophy in long bones:—

Hypertrophy of the Tibia in its Thickness and Length. A girl,

aged twelve years, was admitted into St. Bartholomew's Hospital with scrofulous ulcers along the front of the leg. Beneath the ulcers the shaft of the tibia was so considerably increased in thickness, that its width across its front surface was double that of the opposite tibia, and the hypertrophied tibia was also increased in length to the extent of an inch. The disease had been six years in progress, and it had been accompanied by repeated ulcerations along the front of the leg, which, it appeared to me, were the consequence of inflammation of the periosteum of the hypertrophied bone.

Hypertrophy of the Tibia in its Thickness and Length. A boy, aged fourteen years, with a strongly marked scrofulous constitution, was admitted into St. Bartholomew's Hospital. Four years previously an abscess formed in the thigh, and on the cessation of the discharge from it, the tibia in the opposite leg began to enlarge. The tibia was not only much increased in thickness, but also in length, to the extent of an inch and a half. The periosteum of the hypertrophied bone was much thickened. To relieve himself from the inconvenience of the unequal length of his legs, he had acquired the habit of walking with his knee slightly flexed and his foot twisted outwards.

Hypertrophy of the Tibiæ and Fibulæ in their Thickness and Length. A boy, aged fifteen years, was admitted into St. Bartholomew's Hospital with ulcers along the fronts of both legs. Both tibiæ were greatly increased in thickness, and arched forwards. The fibulæ were also increased in thickness, and arched, but in a less degree than the tibiæ. Both legs appearing to be of unnatural length in relation to the thighs, to determine whether they were so, I measured the tibia in several individuals about eighteen years of age, and found its average length to be little more than eleven inches, but in this boy, who was fifteen years of age, each tibia was found to be thirteen inches and a quarter long; thus showing the hypertrophy in its length to the extent of two inches. The boy stated that the enlargement of the bones of his legs commenced at the age of three years, without apparent cause, and that during its progress there had been many attacks of ulceration in the integuments, followed by exfoliations from the hypertrophied bones.

I have seen instances of hypertrophy in the long bones of the upper limbs; and the subjects of this change in the bones were young, with decided marks of a scrofulous constitution.

The enlargement of bone by hypertrophy is unaccompanied by pain: it advances very slowly, its progress often extending through several

years. Thickening of the periosteum often accompanies the enlargement of the bones, and ulcerations often occur in the integuments covering them, followed by small exfoliations from the hypertrophied bones.

It is very doubtful whether remedies local or constitutional have any other effect on these hypertrophies of the long bones than that of removing the irritation of the periosteum covering them. To this extent the local application of iodine, and the internal use of iodide of potassium with sarsaparilla, are certainly beneficial. But I do not think that these, or any other remedies, will effect a diminution of the bones: once enlarged, they will, I believe, permanently remain so.

Hypertrophy occurs in bones composed wholly of cancellous texture, and frequently in the bones of the face, where it constitutes a disease which, on account of the deformity and other evils attendant on its increase, may require removal by operation.

Hypertrophy of the bones of the face usually begins in early life, and most frequently in the superior maxillary bone. In some cases it is a direct consequence of injury to the part by violence, but in others it cannot be traced to any such cause. The enlargement of the bones usually advances so slowly, that its progress, when the bones are examined at short intervals, is often scarcely perceptible. It is unaccompanied by pain, or even tenderness, in the soft parts investing the enlarged bones, and it does not affect the general health.

Hypertrophy commencing in the superior maxillary bone often extends through the whole of it, and into the adjacent bones, causing the enlargement of them, and frequently the obliteration of the cavities of which they constitute the boundaries. Thus the antrum becomes obliterated, the nasal passages, also the orbit contracted, with displacement of the eye from its cavity; and in some cases the osseous deposit goes on to the extent of forming irregular bosses of hard osseous substance, projecting from the enlarged bones either to the outside of the face or into the nasal and orbitar cavities.

With respect to the treatment of the hypertrophied bones of the face, I can only state, that medicines have no influence upon the disease. The only practical consideration that can arise respecting it, is whether the enlarged bones should be removed by operation, when the disease is manifestly increasing, with its deformity and other attendant evils; and when, on this ground, the propriety of an operation is considered, there will probably be difficulty in determining the exact boundaries between the healthy and diseased bones, since the extent of the latter is not indicated by any morbid change in the soft parts covering

them. I venture, however, to state, that in such cases it need not be a rule from which there should be no deviation, that, as the only justifiable ground of operation, the whole of the diseased parts must be taken away. I know that in cases where only part of the hypertrophied bones has been removed, the wound was healed soundly over the remaining portion of them; and it has not in such instances appeared that the operation was followed by any increase of the disease.

One consequence of hypertrophy in any of the long bones of the lower extremity deserves further notice, namely, the inequality in the length of the limbs, giving rise to much inconvenience and awkwardness in the gait, which I have known to be referred to disease in the hip joint. A man, aged thirty-five, had, since he was twelve years old, suffered from the formation of many small abscesses in different parts of the thigh, accompanied by trifling exfoliations from the femur, and during the whole of this time he had noticed a gradually increasing excess in the thickness and length of the thigh by comparison with the opposite limb; at the same time his movements had become very awkward and unsteady. On measuring the femur, I found it an inch and a half longer than the opposite bone. A student of the hospital observing this case, was reminded that in his own person he had suffered much inconvenience in walking from an inequality in the length of his limbs, which he had attributed to obliquity in the position of his pelvis. He had suffered many small exfoliations from one tibia, which had become very gradually hypertrophied in thickness, and on measuring this tibia, he now found it an inch longer than the opposite bone. He had relieved himself in some degree from the inconvenience in walking, by wearing on the sound limb a shoe having a thick sole and a very high heel.

There are instances of circumscribed hypertrophy or outgrowths of bone, giving rise to tumors of the character of genuine exostoses, but differing from them in having no primordial structure of cartilage or fibrous tissue. Most of these circumscribed hypertrophies of bone are situated at the insertions of tendons. Other osseous growths are of the same character as these: such is the spiculum, which, after amputation, often arises from the end of the bone of the stump: such also are the irregular masses of bone often growing from the bodies of the dorsal and lumbar vertebræ, and less frequently from the bodies of the cervical vertebræ, in advanced life. It seems certain, moreover, that some of the osseous tumors which project from the outer surfaces of bones, but have originated in their interior cancellous texture, are of the character

of these outgrowths or circumscribed hypertrophies of bone, and, accordingly, that they are not preceded by the formation of cartilage or fibrous tissue.

ATROPHY OF BONE.

Bones become lessened in size by the diminution of their healthy tissue. The first distinct notice of an atrophied bone was probably by Chesselden, in the case of a soldier, who, at the siege of Gibraltar, received a wound in the groin, which disabled his limb for the rest of his life; and on examining the femur, after his death, it was found to be one third smaller in its dimensionsthan the femur of the uninjured limb.*

Atrophied bone is, in some instances, simply diminished in size; in others its walls are thinned, and its cells widened; and, occasionally, the cancellous texture wholly disappears, and the bone after maceration presents the characters of the bone of a bird, with its simple tube and thin walls.

An impoverished condition of the body, from defective nutrition, is accompanied by atrophy of the bones, which, from the thinness of their walls and widening of their cells, are then readily broken by the slightest force, often by muscular action alone. Another cause of the atrophy of bone is the interruption of its due supply of blood. Thus Mr. Curling observed, that in the portion of a fractured bone deprived of blood from the medullary artery, the walls become thin, and the cells widened; such, therefore, is the condition of the lower part of a femur or tibia fractured below the entrance of the medullary artery, whilst in the humerus the upper portion becomes atrophied when the fracture has occurred above the entrance of the medullary artery.†

Want of action is followed by atrophy of bone: thus the bones of a paralytic limb diminish with the wasting of its muscles; and, in like manner, anchylosis of the shoulder-joint is followed by atrophy of the humerus, and anchylosis of the hip-joint by atrophy of the femur. Also, after amputation, the bone of a stump which has been little used, becomes lessened in size, with thinning of its walls, and the disappearance of its cells; in short, under any circumstances of suspended or even diminished action, atrophy of bone ensues as remarkably as from the more direct defects of nutrition.

* Anatomy of the bones. By William Cheselden. Fol. Tab. L.

† On Atrophy of Bone. By T. B. Curling. Medico-Chirurgical Transactions, Vol. xx.

Bone atrophied from inaction becomes soft in its texture ; hence the bones of a joint which has been long diseased are often found so soft, that they can be readily penetrated by a scalpel. The softening of bone under such circumstances is probably not from diminution of the earthy matter, but from a change in the arrangement and mode of connexion of its constituent parts: such certainly would be the conclusion from the observations of Dr. Stark, showing that in all bones, notwithstanding the differences in their hardness, the actual proportions of their animal and earthy constituents are nearly the same.*

When atrophy of bone occurs in early life, it is often accompanied by the failure of its growth ; thus the bones of a joint which has been anchylosed since childhood are found atrophied in texture, and of small size, in consequence of their not having grown with the rest of the body. In the following case, failure in the growth of the lower jaw was the consequence of its articulation with the temporal bone becoming fixed. A child at the age of two years suffered an attack of inflammation in the brain, accompanied by convulsions, during which the lower jaw became immoveably fixed, with the mouth closed ; and in this condition it remained. At the age of ten years, when the rest of the face had attained its full development, the lower jaw, still motionless, had not grown ; it remained of the size it was at the age of two years, and a very remarkable deformity of the face was thus produced. I have seen several instances in adults of the same deformity of the face, consequent on the lower jaw having remained of the size it was in childhood, when it became immoveably fixed ; and, in these cases, the cause of the mischief had been the destruction of the soft parts around the jaws from excessive salivation.

Disease in a bone occurring in early life is, in some instances, followed by the interruption of its growth ; thus, in a child, the formation of an abscess upon the upper part of the tibia, accompanied by a partial separation of its epiphysis, was followed by so slow a growth of the tibia, that, several years afterwards, it was found to be an inch and a half shorter than the tibia of the opposite limb. Rickets in any of the bones of the limbs is also very commonly accompanied by arrest of growth, especially in the direction of their length.

But there is, also, a class of cases, of not unfrequent occurrence, in which, without previous disease, or accompanying rachitic affection, or, indeed, any apparent cause, the growth of a single bone, or of all the

* Edinburgh Medical and Surgical Journal, April, 1845.

bones, of a limb is checked, so that the limb never attains its proper length. And when this defect of growth occurs in one of the lower limbs, progression is interfered with, and lameness of an ambiguous character often produced, which has been supposed to arise from disease in the hip-joint. Among the consequences of such defective growth in any of the bones of one of the lower limbs, is the formation of a lateral curve of the spine. And in some among this series of cases, the shortness of the tibia has given rise to lameness, accompanied by permanent elevation of the heel, constituting talipes equinus, requiring the section of the tendo Achilles, which, in such instances, is performed with the best results; for, by a proper management of the limb after the operation, the heel can be made to rest firmly and easily on the ground, without the slightest diminution of power in the muscles of the calf of the leg.

CHAPTER II.

NEURALGIA OF BONE.

By this term I venture to designate a class of cases in which pain arises in a bone, severe and lasting, unaccompanied by inflammation or other organic change in its tissue, and thus, apparently, constituting a nervous affection of bone, like the neuralgia of other structures.

Such cases occur, as might be expected, mostly in females; and the pain in the bone is often accompanied by other symptoms of hysteria. in the instances of this seeming nervous affection of bone which I have met with, it occurred in the shaft, but more frequently in the condyles, of the femur, in the head of the tibia, and in the humerus. In some of the cases, a severe blow on the part preceded the attack of pain in the bone. In some cases the pain was limited to a small extent of the bone; but in others, the pain extended through the whole of it. Compression of the limb aggravated the pain. There was scarcely any increase of heat in the soft parts covering the bone which was the seat of pain, and no more swelling than was occasioned by slight serous effusion into, or thickening of, the subcutaneous cellular tissue.

Local depletory remedies, sedative applications, counter-irritants, all have obtained only a brief mitigation of the pain; nor have constitutional remedies been more effective, with the exception of opium, which subdued the pain so long as the system was under its influence. The general health has not suffered in these cases more than might be expected from the severity and duration of the pain.

Such have been the principal features of this affection of bone; but they do not belong to it exclusively. Inflammation of the substance of the bone and the circumscribed abscess in it, especially the latter, are often accompanied by symptoms, so closely simulating those of the simple neuralgic affection, as to render the diagnosis between them difficult; yet it is a diagnosis of importance, on account of the opera-

tive proceedings which are required for the discharge of matter from the bone in the case of circumscribed abscess, but which, in an instance of simple inflammation, or of the neuralgic affection of bone, would be not merely useless, but probably occasion serious mischief.

When the neuralgic affection in bone has been severe and of long continuance, there is evidence to show it may be followed by derangement of the vascular tissue of the bone, to the degree of producing sanguineous congestion, and even effusion of blood into it. Thus, in one case, after the long continuance of acute pain in the condyles of the femur, the limb being amputated, the only change found in the bone was a preternatural vascularity of its cancellous tissue; and in another case, with a similar history, the limb being amputated, I found red patches, of the character of ecchymosis, in the cancellous texture of the condyles of the femur and of the head of the tibia, which had been the seat of pain.

The diagnosis between the neuralgic affection and inflammation of bone must chiefly rest on the following circumstances: first, the character of the constitutional symptoms, as these are, or are not, such as would afford ground for suspecting the local affection to be of a nervous or hysteric nature; secondly, the character of the local symptoms, and the influence of remedies upon them. The pain attendant on inflammation of bone is usually less severe than the pain of its neuralgic affection; it is rather a constant aching in the bone, than the paroxysms of severe pain, which occur in the neuralgic affection. Moreover, it is to be observed that local remedies do, although slowly, produce their effect on inflamed bone; they obtain more than a mitigation of the pain; when perseveringly used, they will wholly remove it. Not so in the neuralgic affections, for here the best of remedies obtained but a temporary and partial relief.

The following are examples of the neuralgic affection of bone.

Neuralgia of the Femur. A female, aged 29, was admitted into St. Bartholomew's Hospital in September, 1834, on account of severe pain in the inner condyle of the femur, accompanied by some swelling and tenderness, and a slight increase in the temperature of the soft parts covering it. She stated that, six months previously, she fell and struck the fore part of the knee; that the pain in the bone commenced five weeks before her admission; that it had been at times most severe. She was of a spare habit, and there was no more disturbance of the general health than might be ascribed to the suffering she had endured. Perfect rest of the limb, with the repeated application of leeches, pro-

duced no decided benefit. Two issues were made, one close to the seat of pain, the other at a little distance from it, but they were of no avail. Opium controlled the pain, but only so long as the system was under its influence. Mercury was administered to the extent of salivation, and apparently with benefit, but it was of short duration. The general health now declined; pain extended up the thigh and down the leg; and occasionally, pain was felt in the other thigh, from which circumstance it was suspected that the whole disorder might be of a neuralgic character. Under this impression the extract of belladonna was applied to the knee, but it was invariably followed by increase of the pain. The swelling upon the inner condyle was increasing, by the effusion of serum into the subcutaneous cellular tissue. At this period of the case, it was thought that sufficient ground existed for believing that matter was confined within the bone to justify the perforation of it, but the patient would not assent to the operation. Iodide of potassium was given next, in doses, first of five, afterwards of eight, grains twice a day. During the use of this remedy, the pain in the bone very gradually diminished, but it afterwards recurred many times. Eventually the limb became perfectly sound.

In this case, the cessation of the pain in the bone, during the administration of the iodide of potassium, might be thought to indicate that the disease was inflammation of the periosteum or of the bone; but the character of the constitution, and of the local symptoms, and the progress of the disorder, were strongly in favour of its neuralgic nature.

The following narrative was drawn up by Mr. Bayntin, who was in constant attendance upon the patient.

Neuralgia of the Femur. "A lady, aged twenty-nine, in descending a winding staircase, fell and severely bruised her left hip; tenderness of the part ensued, which in a few days completely subsided. In the course of tthe following month she began to suffer pain in the middle and front of the thigh of the same side, and it was referred to the bone. The pain gradually increased; and while at first it occurred in paroxysms lasting a few hours, it had lately become constant, and most severe. Compression of the thigh aggravated the pain, but not until it was sufficient to affect the deep parts of the limb. There was no increased heat, swelling, or other sign of inflammatory action in the soft parts around the femur. The tongue was clean and the pulse tranquil. Mercury, opium, iodine, and quinine, were perseveringly employed until each had produced its full effect on the system. Every variety of local application was tried, but upon the pain in the thigh

the best of the remedies had only a temporary effect. The case was repeatedly seen by Mr. Stanley; it also received the benefit of Mr. Blizard's and Mr. Lawrence's attention. Throughout there was apprehension of organic disease, commencing either in the periosteum or bone, with a suspicion, however, that it might be a neuralgic affection without change of structure in one or other part. At length, after the endurance of severe suffering above three months it began to remit, and by degrees the remissions were for a longer period and more complete. In this way the case proceeded slowly towards a complete recovery. Nothing occurred to explain the cause of the pain in the femur, nor could the removal of it be ascribed to any of the various remedies employed."

Neuralgia of the Tibia. A female, aged twenty, of slender frame, stated that her left knee, she knew not why, swelled, became painful and contracted. Through the four following years, as a patient in several metropolitan hospitals, and in attendance on various dispensaries, every variety of treatment had been repeatedly applied to the joint, and at one period it recovered sufficiently to enable her to walk without inconvenience; but a few months afterwards pain and swelling returned in the knee with increased severity, and continued to the period of her admission into St. Bartholomew's Hospital, when the following was the condition of the joint,—it was immoveably fixed in the bent position, the pain in it was acute, but more so on the inner side of the head of the tibia, where the soft tissues covering the bone were slightly thickened. From the history and present circumstances of the case, I could not but apprehend disease in the joint; and from the fixedness of the pain in the head of the tibia, with the thickening of its coverings, it was thought that this might be the seat either of abscess, or of necrosis in a portion of its cancellous texture. Her general health was extremely feeble, with total failure of appetite, and absence of sleep except from the influence of strong opiates. Her constitution appeared to be sinking, and consequently it became necessary to consider the propriety of removing the limb. A consultation was held on the case, at which the principal question apparently requiring consideration was, whether the limb should be removed, or the head of the tibia perforated in the expectation of finding matter or dead bone within it; and the decision was that the limb should be removed. This was accordingly done, and, on examining the joint, several dark patches were found in the cancellous texture of the condyles of the femur, and of the head

of the tibia, presenting however rather the character of ecchymoses than of inflammation of the bone; there had been, besides, partial absorption of the articular cartilage upon the condyles of the ferum; but from the appearances of a part I inferred that this removal of the cartilage was nothing more than the effect of the undue pressure it had received in the contracted and rigid state of the joint.

CHAPTER III.

INFLAMMATION OF BONE.

In the healthy organization of bone provision is made for the free circulation of blood through its tissue by the large diameter of its vascular canals; and it is by the dilatation of the vessels within these canals that inflamed bone becomes of a red colour. In a young person, from the front of whose tibia the skin and periosteum had been detached by violence, the exposed bone was first of a pale rose tint, and afterwards of a deep red colour, when its substance had become inflamed. The excessive vascularity of inflamed bone is observed in cases of necrosis, where perforations of the living bone are made for the removal of dead bone; for, in such operations, blood is often seen flowing from the cut surface of inflamed bone as freely as from inflamed muscle or other very vascular soft tissue.

Increase in the sensibility of inflamed bone is not less marked than the increase of its vascularity. When, in operations, inflamed bone is perforated or divided, the pain is severe; and the granulations which arise from inflamed bone participate in the morbid sensibility of its tissue.

From the inflamed tissue of bone there are products corresponding with the albuminous products from the inflamed tissues of soft parts. It may be that pus is produced from the inflamed compact osseous tissue. Into the inflamed cancellous tissue pus is certainly deposited; the source of it here, probably, is the fine and very vascular membrane which lines the cells of bone.

It results from the intimate connexion which, in respect to their vascular and nervous endowments, the component parts of a bone hold one with another, that they readily reciprocate their morbid actions; not, however, in an irregular manner, for there is an order observable in the progress of inflammatory changes from one part of a bone to another. Inflammation of the medullary membrane is followed by inflammation

in the periosteum and outside of the bone. Moderate inflammation of the medullary membrane is followed by thickening of the periosteum, and by osseous deposits on the surface of the bone, with expansion and thickening of its outer lamellæ. Acute inflammation of the medullary membrane is followed by ulceration of the periosteum, by suppuration beneath it, and by ulceration of the surface of the bone. Inflammation of the periosteum is followed by thickening of the inner lamellæ of the bone.

Enlargement of bone is the general effect of inflammation in its tissue. But its characters vary with the circumstances giving rise to the inflammation; and it may be accompanied by the expansion or induration of the bone, or by osseous deposits upon its surface.

ENLARGEMENT OF BONE BY EXPANSION OF ITS TISSUE.

The expansion of the tissue of bone is, in some respects, analogous to the inflammatory swelling of soft parts. More than twenty years ago, I had the first distinct view of this change in the bones of an elbow-joint, from a boy ten years of age, whose arm was amputated by Mr. Abernethey. These bones were preserved in the museum of St. Bartholomew's Hospital*; and I have been accustomed to exhibit them in my lectures as an example of the pathological fact in question. Recently, in a more extended view of these morbid processes, when engaged with Mr. Paget in the examination of the vast series of diseased bones in the Museum of the College of Surgeons, I have learned that the simple swelling of bone, from expansion of its tissue, is one of the most frequent alterations to which it is liable.

In the swollen or expanded bone its lamellæ are separated, its vascular canals widened, and its cells enlarged. By these changes the bone is softened, not that its lamellæ and the walls of its cells are thinner than naturally, but that by their separation and the widening of their interspaces, the bone loses so much of its compactness and power of resistance that it readily yields to compression. The liberality of Mr. Arnott, of University College Hospital, has furnished me with some striking illustrations of this condition of the bone, obtained from a case in which, on account of disease in the elbow-joint, excision of the ends of the bones had been performed. Inflammation ensued in the remaining portion of the humerus, accompanied by severe constitutional

* First series, No. 56, Plate 1, figs. 2, 3.

derangement, which terminated fatally. The inflamed bone was of a deep red colour, and considerably enlarged by the expansion of its tissue*.

The enlargement of bone by expansion occurs in its compact and in its cancellous tissue. I have seen many instances of expansion of the articular ends of bones, especially of the inner condyle of the femur and of the head of the tibia, ensuing from a blow or other slight injury. The gradual enlargement of the bone was accompanied by tenderness in the part, by a slight increase of its heat, but by no change in the soft coverings. Local depletory remedies and counter-irritants were in such cases effective in restoring the part to a natural condition, as far as its sensations were concerned; but, as in other affections of bone, the morbid action very often recurred, and I have not in any instance clearly recognized a diminution of the enlarged bone. I believe that a bone once enlarged by the expansion of its tissue will permanently remain so.

ENLARGEMENT OF BONE WITH INDURATION OF ITS TISSUE.

The enlargement of bone with induration is the effect of prolonged inflammation in its tissue; and, according to the observation of Mr. Paget, it appears that the lamellæ of the inflamed bone are first separated and its cells widened; and that the lamellæ become thickened, hardened, and consolidated together. As, in the original formation of bone, its solidity is owing to the formation of osseous concentric laminæ upon the insides of the Haversian canals, so, in disease, its induration is the effect of increased osseous formation within these canals, narrowing some of them and obliterating others. Accordingly, indurated bone is less vascular and less oily than healthy bone, and in the microscope its vascular canals are found to be few and of small size.

The enlargement and induration of bone may occur in its compact or in its cancellous tissue, and either in the whole bone or exclusively in its outer or inner lamellæ. When the inner lamellæ of a long bone become separated from each other, and are thickened and indurated, they arch inwards, so as to encroach upon the medullary tube, often to the extent of obliterating it.

The degree of induration in bone is probably proportionate to the duration of inflammation in its tissue. In its extreme degree, the bones acquire the hardness and compactness of ivory, and these changes are

* Plate 1, figs. 4, 5, 6.

accompanied by proportionate increase of their weight. A skull in the Museum of St. Bartholomew's Hospital, the bones of which are very thick and hard, weighs, without the lower jaw, three pounds three ounces; the heaviest of three healthy skulls weighing one pound fourteen ounces.

Local injury is occasionally the cause of enlargement and induration of bone; thus, a blow upon the shin may be followed by the enlargement of the tibia; and I have known instances where a blow upon the head was followed by thickening with induration in the bones of the cranium. But these conditions of bone are mostly the effect of rheumatism; and accordingly, in hospital practice, the instances of them are very numerous in one or more of the long bones in both sexes, but particularly in those who in their occupations have been much exposed to the influences of cold and moisture.

Pathological museums abound in examples of long bones, the shafts of which are misshapen, enlarged, and indurated, more especially the femora and tibiæ, less frequently the bones of the upper limbs. In most instances the morbid changes are symmetrical; the two femora or two tibiæ being enlarged equally, and so exactly alike in every other particular, that without any knowledge of their history, we confidently pronounce the symmetrically diseased bones to have belonged to the same person.

In several instances I have been able to ascertain, that the individuals in whom these conditions of the bones existed, had suffered in their limbs the long-enduring, or many times recurring, attacks of rheumatic inflammation. One old man, all of whose long bones in the upper and lower limbs I found greatly enlarged, told me, that for many years he had scarcely ever been free from rheumatic pains. Another patient, a female, thirty-five years of age, whose femora and tibiæ were greatly enlarged, stated, that at the age of fifteen she suffered an attack of rheumatic fever, since which the pains in her bones had never completely left her. I had the opportunity of observing the whole course of the disease in a boy fourteen years of age, who was admitted into St. Bartholomew's Hospital when suffering acute inflammation in three large joints simultaneously, the hip, knee, and ancle of the same limb. Upon the subsidence of the inflammatory affection of the joints, inflammation ensued in the periosteum of the femora and tibiæ, followed by suppuration beneath the periosteum, and by gradual enlargement of the shafts of the bones. During several months whilst the bones were enlarging the general health of the boy was very feeble, but it was as-

certained that his urine contained its ordinary healthy constituents. In other cases I have been interested in observing, that on the occasions of exposure to extreme variations of temperature, especially from heat to cold and moisture, fresh paroxysms of irritation have arisen in the diseased bones, accompanied by much pain in them and tenderness in the periosteum; each paroxysm subsiding under the influence of iodide of potassium, but with an increase in the size of the bone.

From long enduring rheumatic inflammation in any of the large joints, more especially in the hip, the cartilages are absorbed, and the bones become indurated, enlarged, and altered in their form, probably from the pressure they have received in an early stage of the disease when their texture was softened by inflammation; thus the head of the femur becomes broad and flattened, and of irregular figure, with corresponding changes in the acetabulum. With induration of the articular ends of bones, their surfaces, when deprived of cartilage, become smooth and polished, with a porcellaneous appearance, owing to the Haversian canals becoming filled with earthy substance*.

Upon enlarged and indurated bone medicines have no effect: its condition will be permanent. Individuals, in whom these changes have occurred in the long bones, are doomed for the rest of life to the discomfort of dragging about their misshapen and heavy limbs, thus presenting another to the catalogue of miseries to which rheumatism gives rise. But against the tenderness and irritation of the periosteum, which precede and accompany the morbid changes in the bones, treatment may be directed with the best effect, particularly the local application of mercury to the limb, with the administration of iodide of potassium and sarsaparilla.

ENLARGEMENT OF BONE BY OSSEOUS DEPOSITS ON ITS SURFACE.

Such an enlargement of bone is the consequence of inflammation in its periosteum. The following is the mode of its occurrence,—gelatinous substance is deposited on the surface of the bone, and becomes cartilaginous and then osseous. A thin layer of osseous substance is thus formed between the periosteum and the bone, to both of which it is united by vessels. At first, the osseous layer may be readily peeled off from the bone, but afterwards is inseparably united to it. As the osseous deposits increase, they assume such an irregular form, that

* Microscopic observations, by Mr. Quekett, of the Royal College of Surgeons.

they may be represented as rock-like masses of osseous substance, projecting from the bone and enlarging it.

Rheumatic inflammation of the periosteum is probably the most frequent cause of these osseous deposits upon the surface of bones; but they occur under other circumstances. For instance, in the skulls of young females who have died whilst pregnant, or shortly after parturition, such osseous deposits have been found upon both the outside and the inside of the skull, but more especially in the latter situation. The successive stages in the formation of these deposits have been distinctly traced; consisting, first, in a vascular exudation from the surface of the skull, which changes into cartilage, and then osseous substance is mixed with the cartilage in the form of dense lamellæ and spicula, which are firmly united to the skull. Although the occurrence of this disease appears to have a close relation with the pregnant and puerperal states, it is not preceded or followed by any peculiar or distinctive symptoms*.

The diagnosis of these various enlargements of bone cannot always be made during life; nor is this practically of consequence: it is sufficient to know that inflammation in bone occasions its enlargement, either by simple expansion or with induration, and that inflammation of periosteum occasions the enlargement of bone by osseous deposits on its surface. Further, in respect to the action of particular diseases, it is to be observed, that whilst rheumatic inflammation occasions general enlargement of the shafts of bones, syphilitic inflammation in periosteum gives rise to circumscribed swellings of the bones, or nodes. These several forms of disease may all be found in the several bones of the same individual. Of this a remarkable instance occurred in a Negro, a patient in St. Bartholomew's Hospital. He had suffered from syphilis, and besides severely from rheumatism, the consequence of exposure to cold and moisture in the streets of London, in which for a long time he had almost wholly lived. Some of his long bones were found simply expanded, others expanded and indurated, and others, especially the tibiæ and fibulæ, and the bones of his hands and feet were found irregularly enlarged by osseous deposits on their surface, from the rheumatic inflammation of which their periosteum had long been the seat†.

It is remarkable, that whilst the pericranium, in its structure and relations to the cranium, differs in no respect from periosteum in its rela-

* Rokitansky; Pathologische Anatomie, Bd. ii., p. 237. There is also a memoir on this subject by M. Ducrest, Mémoirs de la Société Médicale d'Emulation de Paris. T. ii.

† Museum of St. Bartholomew's Hospital.

tions to other bones, yet that from the pericranium osseous deposits probably never arise*. Accordingly, the cranial bones are not found enlarged by osseous deposits on their outer surfaces; their enlargement is mostly the effect of expansion with induration of their texture, but is, in some rare instances, the effect of osseous deposits on their internal surfaces.

Enlargement of the bones of the skull is frequently coincident with local or general nervous affections; but in such cases it is, in general, difficult to determine, whether the nervous affection holds the relation of cause or effect to the altered structure of the bones. The character of the nervous affection varies in different instances, probably in accordance with the predisposition of the individual. Thus, in some cases, enlargements of the skull have been accompanied by insanity; in others, by epilepsy; and in others, by local nervous symptoms, of the character of tic douloureux. Dr. Greding, physician to a hospital at Waldheim, receiving a large number of lunatics and demented persons, has recorded, that of two hundred and sixteen cases, including those of madmen, idiots, and epileptics, the skull was found unusually thick in one hundred and sixty-seven; but that in many of the remainder the skull was unusually thin. Other inquirers have reported the number of cases of insanity, accompanied by disease in the skull to be proportionately less considerable†. Dr. Bright has recorded cases of epilepsy, in which the bones of the skull were found much increased in thickness and density‡: and there are on record some remarkable cases of tic douloureux having its seat in the nerves of the face, accompanied by osseous growth or other source of irritation in the bones contiguous to the affected nerves§. But it is certain, that in the generality of cases of tic douloureux no accompanying change of structure can be any where discovered. I am acquainted with two cases, in which tic douloureux had long existed in the supra- and infra-orbitar nerves, and in which not the slightest deviation from healthy structure was detected in the most careful examination of the affected nerves, and of the parts connected with them.

* The osseous deposits which, in rare instances, have been found on the exterior of the skulls of females who died when pregnant, or during the puerperal state, are but an apparent exception to this statement; for here the exudation is from the skull, not from the pericranium.

† Pritchard on Insanity. Results of necroscopical researches into the changes of structure connected with Insanity, p. 209.

‡ Medical Reports, Vol. ii.

§ Essays and Observations, by Sir Henry Halford.

GENERAL CONSIDERATIONS ON THE TREATMENT OF INFLAMMATION IN BONE.

Inflammation of bone is to be treated according to the same principles as inflammation of other structures; but, with respect to the selection of remedies, the mode of using them, and the influence they are likely to have on the morbid processes in bone, there are circumstances to be mentioned.

Bone is not readily impressed by external agents: its organic changes in health and in disease being of slow progress, the remedies which influence them are proportionately slow in their operation. But, notwithstanding the little susceptibility bone possesses, its nervous and vascular endowments are so far in harmony with the rest of the system, that when the nervous system is unquiet, and the digestive organs are deranged, the disease of bone, like the diseases of soft parts under the same circumstances, are with difficulty controlled.

To subdue acute inflammation in bone, especially when seated in the medullary membrane of a long bone, the requisite measures are depletion and medicines adapted to repress vascular action and subdue pain. An acute and persisting pain in the centre of a long bone, quickly followed by fever and excitement of the nervous system, are sufficient to warrant apprehension that the medullary membrane is the seat of inflammation, and to call for activity of treatment; for it is most important the disease should be arrested before it advances to the stage of suppuration in the bone, by which the limb and even the life of the patient is likely to be endangered.

The local remedies for subduing inflammation in bone are, abstraction of blood from the surrounding soft parts, with fomentations, warm poultices, or cold lotions, as the feelings of the patient may indicate. That these remedies may produce their full effect, it is necessary that the diseased part be in a state of perfect rest, and that its position be such as will not favour the congestion of blood in its vessels. Another local remedy of much value for subduing inflammation in bone, is mercurial ointment constantly and plentifully applied to the surrounding soft parts.

There is, besides, an internal remedy, which never fails to assist in the removal of inflammation from bone. This is iodide of potassium. There have been differences of opinion respecting the most effective dose of this remedy. My experience is in favour of its administration

in small doses; for I have not observed, that, when given in large doses, it has more rapidly, or with more certainty, cured the disease. The dose which I ordinarily direct is either two or three grains, three times a day, in camphor mixture or in a bitter vegetable infusion, and in conjunction with sarsaparilla, when, with the disease in the bone, the vital powers are at the same time feeble and depressed.

It is probably true, that iodide of potassium has the most distinct and best marked influence upon the inflammation of membranous structures; and, accordingly, that its remedial effects will be greatest when the seat of inflammation is the periosteum or medullary membrane, rather than the osseous tissue. But the inflammatory action, whatever was its original seat, soon spreads through the entire bone; therefore iodide of potassium is the remedy for inflammation in bone under all the circumstances of its occurrence.

My experience of the use of iodide of potassium in the syphilitic affections of bone, agrees with the records on this subject by Martin Hassing, of Copenhagen*, who states, that, "in no other symptom of syphilis is the iodide so efficacious, and its effects so certain as in these cases of pains in the osseous system, whether they occur by night or day, or have troubled the patient for years, or only for a few days;" and he subjoins a statistical account of seventy-three cases of pains of the bones treated by iodide of potassium, in sixty-five of which the pains wholly disappeared, while in three they were diminished, and in five the iodide was given without effect. And here it is but justice to the memory of Dr. Williams, physician to St. Thomas's Hospital, to acknowledge the great service he rendered to medicine, in having been the first to notice the influence of iodide of potassium as a remedy in secondary syphilis†.

In the acute affections of bone, when seated in the medullary membrane, it is expedient, with the employment of mercury as a local application to the surrounding soft parts, to administer it internally, in the view of producing its full influence upon the system. Calomel and opium are well suited for this purpose; and of the power which the constitutional action of mercury has to arrest acute inflammation in bone I am well assured by experience. But it must be admitted, that these acute affections of bone, requiring active mercurial treatment, are rare

* British and Foreign Medical Review, October, 1845.

† The first notice of this subject, by Dr, Williams, was in a paper read at the College of Physicians in 1834, and it is fully treated in his Elements of Medicine, 2 vols. 8vo. 1836—1841.

by comparison with the less acute and long-enduring affections of bone, for which iodide of potassium is the suitable and almost invariably effective remedy.

When there has been long-enduring, or often repeated inflammatory action in bone, counter-irritation, established in the parts adjacent to the seat of pain, is often useful. But, for the good which the counter-irritant can effect, it must be kept in full activity; if it is allowed to become indolent, the pain in the bone will quickly recur. And it is to be understood, that counter-irritation is applicable to all the painful enlargements, indurations, and thickenings of bone, which other remedies have failed to relieve. I am sure that I have, by counter-irritation, obtained the perfect quietude of many such enlargements of the articular portions of bones. In illustration of the effect which a discharge from the surface of a limb may have in quieting the irritation of diseased bone, I mention the case of a boy in Christ's Hospital, suffering from disease of the elbow-joint, at the time Mr. Abernethy was surgeon to the institution. Suddenly, and without apparent cause, the integuments covering the joint became extensively ulcerated; this was regarded by me as an aggravation of the disease; but it was otherwise viewed by Mr. Abernethy, and rightly so, for the ulceration on the surface of the joint operated as a natural issue, in relieving the irritation of the diseased bones; directly the integuments ulcerated, the pain in the joint subsided.

The use of counter-irritation in the treatment of the diseases of bone is to be regulated by the following considerations. It is not to be employed whilst the inflammatory processes in the soft parts around the diseased bone are active; nor until they have sufficiently subsided to allow the issue or seton to be placed near enough to the diseased bone to control the actions within it. The extent and the situation of the counter-irritant are to be determined by the degree of thickness of the soft parts covering the diseased bone. When the carpal or the tarsal bones are the seat of disease, a large issue placed directly over them will be likely, from the thinness of their investing soft parts, to aggravate the disease. When, on the other hand, the bones of the hip, or of the shoulder-joint, are the seat of disease, the thickness of their investing soft parts permits the issue to be placed directly over them. The counter-irritant is to be regarded as a controllable disease established on the surface of the limb, in the hope that it will divert the activity of the organic processes from the diseased bone; but that it may have this effect, care is to be taken that the new disease does not ex-

tend its sphere of irritation to the old one. It is, moreover, inexpedient to apply a counter-irritant in cases where there is much suppuration from the soft parts around the diseased bone: for here, provided the matter has a free outlet through the surrounding fistulous passages, the discharge issuing through these will afford all the relief to the irritation of the diseased bone that can be obtained by the artificial drain of an issue or seton. The cases which are most benefited by a counter-irritant are those in which the diseased bone is unaccompanied by abscess in the contiguous soft parts, or where the discharge through any fistulous passages that may lead to the diseased bone, is so trifling as to afford no adequate relief to the pain and irritation in the adjacent parts.

CHAPTER IV.

SUPPURATION IN BONE.

Suppuration in bone is in some cases of small extent, and the matter is contained in a single round or oval cavity hollowed out of the substance of the bone. But in other instances the matter is diffused more or less extensively through the cancellous texture or medullary tube of the bone. Thus the abscess in bone is conveniently distinguished into the circumscribed and diffused.

The circumscribed abscess is mostly situated near to, or within, the articular ends of long bones; but I have seen it in the middle of their shafts. The cavity in the bone is usually lined by a very vascular membrane, and around it the bone is hardened, also, in some instances, enlarged by the expansion of its texture. The periosteum and adjacent cellular tissue covering this part of the bone are generally thickened. In some cases a narrow passage has formed in the osseous wall of the abscess, through which the matter has escaped from the interior of the bone. In this way the matter has passed from the abscess within the articular end of a bone into the adjacent joint; and I have known several instances of destruction of the knee-joint consequent on the escape of matter into it: in some cases, from the articular end of the femur, and in others, from the head of the tibia; and in one case, the abscess, which burst into the knee-joint, had formed within the cancellous texture of the patella.

In most cases, the circumscribed abscess in bone cannot be traced to local injury or other distinct cause. The symptoms which ensue from it are such as might be expected from the confinement of matter within the dense tissue of bone. Generally, at the seat of the disease, the coverings of the bone are tender, a constant aching is felt in the bone, with paroxysms of acute pain and severe constitutional derangement. It is remarkable, that in some instances there has been a remission of

the symptoms so complete and for so long a period, that the patient has supposed himself to be well; but the pain in the bone, from the confinement of matter within it, has returned. In one case I distinctly traced the remission of the symptoms to the formation of a passage in the wall of the abscess, permitting the escape of the matter from the interior of the bone into the parts around it.

It is probable that, in some cases, a deposit of tubercle has preceded the circumscribed abscess in bone, and that the tuberculous matter, mixed with purulent fluid, has then passed out of the bone, leaving a cavity in the bone analogous to the tuberculous cavity in lung. Such appeared to have been the character of the disease, in instances where I found masses of tuberculous matter, mixed with purulent fluid, filling excavations in the articular ends of bones communicating with the adjacent joints.

The circumscribed abscess in bone usually remains of small size, but in some cases it has enlarged much beyond the natural limits of the bone. Such an enlargement of the abscess is not the effect of simple expansion of the walls of the bone; for, in some of these cases, the osseous wall of the abscess has increased in thickness with the enlargement of its cavity. The process is of a vital nature, consisting in the combined actions of absorption on the inside of the abscess, and of osseous deposit on its outside, whereby its osseous walls may acquire any degree of thickness, according to the predominance of absorption in the one direction, or of deposit in the other. Such an enlargement of the abscess is but the repetition of the natural process of growth, effecting the gradual enlargement of the medullary tube of a bone, proportionate to the increase of its circumference. In the museum of the Royal College of Surgeons in Edinburgh, there is an instance of a large osseous cyst originating in the head of the tibia, the walls of which are more than an inch in thickness. A circular aperture, about an inch in diameter, extends through the wall of the cyst, in which the patient used to introduce a wooden plug, and withdraw it to allow the escape of the matter on feeling pain from distension of the cyst. In this way, from sixteen to twenty-four ounces of purulent fluid were every day discharged from the cyst*. In the same museum there is an osseous cyst, probably originating in abscess, within the lower part of the femur, which is twenty inches in its circumference; and in the

* For the representation of this remarkable specimen I am indebted to the late Professor Russell, of Edinburgh. Plate 6, figs. 1, 2.

museum of St. Bartholomew's Hospital there is a sacrum, the walls of which are expanded into a cyst, which was filled with purulent fluid*.

Diffuse suppuration through the cancellous and medullary tissue of a bone is usually a most formidable disease, leading to destruction of the bone and of the soft parts around it, with the most severe constitutional derangement.

Local injury is in many instances the cause of diffuse suppuration through a bone; thus, from a blow on the skull, suppuration has ensued through its diploe; and from a blow on the leg, suppuration has ensued through the medullary tube of the tibia. In one case, diffuse suppuration through the tibia occurred from long exposure of the limb to severe cold and moisture. There are also instances of diffuse suppuration through the medullary tissue of long bones arising in the course of fever. Such appeared to be the nature of the following case. "The patient, about forty years of age, was seized with a fever, attended w h violent symptoms, and in about a fortnight a swelling suddenly appeared upon the whole leg, accompanied by great inflammation and pain, and matter was discovered extending from the knee to the ancle; upon the discharge of which, the bone was found carious in its whole length. Amputation of the limb was performed. Upon the examination of it, the tibia was found filled with purulent fluid†."

When, after amputation, sloughing has ensued in the soft parts around the end of the bone, suppuration is often found extending some way within the medullary tube. Also, in compound fractures, suppuration frequently ensues within the medullary tube of the broken bone. In these instances, the inflammation usually appears to have extended from the soft parts into the bone; but occasionally it is otherwise. Either after amputation, or in compound fractures, inflammation, followed by suppuration, has directly ensued in the medullary tissue of the bone. The following is an instance of it after amputation:—

Diffuse Suppuration in the Femur. In a young, and apparently healthy, man, the thigh was amputated, by Mr. Abernethy, in its lower third, on account of enlargement of the knee-joint, supposed to depend on thickening of its synovial membrane. A few days after the operation, severe pain was felt deep in the thigh, and much constitutional disturbance arose, chiefly affecting the nervous system, which continued to his death, on the twenty-eighth day after the removal of

* First Series, No. 28. † Gooch's Surgery. Vol. ii.

the limb. On examining the knee, I found that the enlargement of the joint was produced by a mass of encephaloid substance originating within the condyles of the femur; and in the stump I found the periosteum upon the remaining portion of the shaft, and upon the neck of the femur, very thick and vascular, and detached from the bone. The medullary tube of the shaft, and the cancellous tissue of the head and neck of the bone, were filled with purulent fluid. The medullary membrane was readily recognized by its thickness and vascularity. On removing the periosteum from the tibia, its surface was found mottled by effusions of blood into its substance, resembling the spots and blotches of purpura*.

Similar cases to the foregoing are recorded by M. Reynaud, in a Memoir on Inflammation of the medullary tissue of the long bones†. In some of these, suppuration in the medullary and cancellous tissue of the bone was combined with suppuration in the principal veins of the limb, and with purulent deposits in distant organs and cavities. Cruveilhier, also, has reported, that in cases where there had been wounds of the scalp, he found purulent fluid in the veins ramifying through the diploe of the cranium, and purulent deposits in the lungs and liver. Cruveilhier considers it to be well established that phlebitis in the bones is one of the most frequent causes of visceral abscess succeeding to wounds, by accident or surgical operation, in which the bones are implicated; and states that, during the year 1814, in nearly all the patients at the Hôtel Dieu who died after amputation, he found suppuration in the medullary tissue of the long bones‡. In this country, Mr. Phillips, of the Westminster Hospital, has recorded observations to the same effect§; and Dr. Carswell has given some excellent representations of suppuration in the medullary tissue of the femur combined with inflammation in the veins of the limb‖. But, notwithstanding such an amount of evidence on the subject, it is nevertheless true that suppuration through the medullary tube of a bone after amputation is not a frequent occurrence.

There have been instances in which suppuration through the medullary tube of a bone was, in an early stage of the disease, deprived of

* Museum of St. Bartholomew's Hospital. First series, Nos. 46, 47, 48. Plate 18, figs. 3, 4.

† Archives Gén. de Médecine. Juin, 1831.

‡ Anatomie Pathologique, T. I., liv. xi., fol.

§ Medical Gazette, Vol. xiii.

‖ Illustrations of the elementary forms of disease. Fasciculus viii., plate 3.

its usual severity and danger by the escape of the matter from the interior of the bone through ulcerated openings in its walls. Long persistence of pain in a bone, followed by the sudden remission of it on the appearance of an abscess in the adjacent soft parts, form the chief part of the history of such a case. But its features may not be readily recognized; it was so, at least, in the following instance.

Suppuration in the medullary tube of the Humerus. A man was admitted into St. Bartholomew's Hospital, who stated, that for several months he had suffered pain in the bone of his arm, which had lately subsided on the appearance of a swelling in the adjacent soft parts. I found an abscess, in the upper third and inside of the arm, of the size of a walnut, and its cyst was so loose and circumscribed that it appeared to be wholly subcutaneous. Accordingly, it was not supposed to have any connexion with the bone, and the real nature of the disease was not suspected. But, after some time, rapidly destructive inflammation ensued in the elbow-joint, on account of which the arm was amputated near the shoulder. On examining the humerus, I found its medullary tube filled with purulent fluid and lymph, and the medullary membrane much thickened. Minute ulcerated holes in the walls of the bone communicated with the abscess in the adjacent soft parts, and in the articular end of the bone there was an ulcerated channel through which the matter escaped from the medullary tube into the elbow-joint.

Suppuration through the medullary tube of a bone is, in some cases, accompanied by necrosis of its walls. The evidence in such cases, that the mischief commenced in inflammation of the medullary membrane, would be the deposit of purulent fluid or lymph within the bone, which is not a character of necrosis arising under any other circumstances. This point will be illustrated by the following case.

Suppuration through the medullary tube of the Tibia, accompanied by necrosis of its walls. A youth, eighteen years of age, was brought from the country to St. Bartholomew's Hospital, with the following history of his case,—that six weeks previously he sprained his ancle, and on the following day had lain on the wet ground with a powerful sun shining on him. On the next day the whole leg became red, swollen, and painful. A few days afterwards, a large quantity of matter was discharged by incision near the ancle, and other openings for the same purpose were subsequently made near the knee. The suppuration extending through the leg had been accompanied by the most severe constitutional derangement. A probe being passed through the openings

in the soft parts to the tibia, this was found to be denuded of periosteum through its entire length and circumference. The knee and ancle-joints were acutely painful. The boy was emaciated, his countenance flushed, his pulse very frequent and feeble, his nights sleepless from pain. I felt certain that the primary disease had been inflammation of the medullary membrane of the tibia, from the severity and rapid progress of the symptoms, and especially from the extension of the inflammation through the articular ends of the bone to the joints of the knee and ancle. A week after the admission of the boy into the hospital, it became evident that amputation of the limb afforded the only chance of preserving his life. In consequence of his exhausted state I did not venture to remove him from the water-bed upon which he lay, but drew him to the edge of it, and there removed the limb. His recovery was complete.

On examining the limb, I found purulent fluid in the knee and ancle-joints, with the almost complete destruction of their articular cartilages. The shaft of the tibia, in its whole extent, was denuded of periosteum, but the membrane was entire except in the spots where incisions had been made through it for the discharge of matter. The inner surface of the periosteum was extremely vascular, so soft and velvet-like as to resemble acutely-inflamed conjunctiva. Through the medullary tube and cancellous tissue of the bone there were deposits of thick purulent fluid. The walls of the bone were no where perforated: hence the certainty that the purulent fluid found within it was the product of inflammation in the medullary membrane. The epiphyses at both ends of the tibia were loosened by suppuration between them and the shaft. A commencing line of separation at each end of the bone, near the epiphyses, indicated that the shaft had perished; this, indeed, was to be expected as the consequence of inflammation in the medullary membrane and in the periosteum, with the entire separation of the latter from the bone*.

The following cases will further illustrate the history of inflammation in the medullary membrane:—

Acute inflammation in the Head of the Tibia, probably commencing in the medullary membrane. The following history well illustrates the severity of the local effects and constitutional derangement occasionally produced by these acute affections of bone, whether originating in the periosteum or medullary membrane; for, in this instance, as in others

* Museum of St. Bartholomew's Hospital. First series, No. 195. Plate 7, fig. 1.

which I have seen, it was not readily determined in which of these structures the inflammation commenced.

A youth, aged sixteen, having a strumous constitution, complained of slight pain in the knee-joint, which had not arisen from local injury or other apparent cause. At the same time, a little thickening and tenderness were discovered in the soft parts upon the inside of the head of the tibia. These symptoms continued several days but little influenced by treatment, when the most acute inflammation suddenly arose within the joint and in the soft parts around the head of the tibia. The accompanying pain was most severe; active local depletion did but little to mitigate it. There was also high inflammatory fever with delirium, which continued without intermission above a week, and was not calmed by the largest doses of opium. All these symptoms were relieved, however, by the bursting of a large abscess a little below the knee. Extensive denudation of the tibia ensued, and was followed by exfoliation of a large portion of its shaft with permanent anchylosis of the knee-joint.

*Acute inflammation in the medullary membrane of the Tibia**. "A man, aged twenty, who had suffered from suppuration in the cervical and axillary absorbent glands, was attacked by erysipelas in the left leg, accompanied by severe pain and inflammatory fever. Ulceration ensued in the soft parts, exposing the whole inner side of the tibia. Diarrhœa came on, and, for the preservation of life, it became necessary to amputate the limb above the knee, on the forty-third day from the commencement of the disease. On examining the limb, all the soft parts were found infiltrated with bloody serum. The periosteum of the tibia, denser and more vascular than it is naturally, adhered but loosely to the bone, and plates of osseous matter were deposited in its tissue. There were several ulcerated channels extending through the walls of the bone to the medullary tube. Several portions of the bone between these channels had perished. The medullary membrane, in some situations, was of a deep red colour, resembling the conjunctiva of the eye in chemosis, and in others it was black, with a gangrenous odour."

Suppuration in the bones of the Tarsus and Metatarsus. A man, aged 70, was admitted into St.Bartholomew's Hospital with disease in his foot, which commenced twelve months previously, without apparent

* Journal Hebdomadaire des progrès des sciences, Novembre, 1834, related by M. Dubrueil, Professor in the Faculty of Medicine, Montpellier.

cause. A fistulous passage in the upper part of the foot extended to the tarsal bones, and, at the bottom of it, much rough and loose bone could be felt. The disease spread gradually through the entire tarsus and metatarsus, accompanied by sloughing and suppuration in the surrounding soft parts. Amputation of the limb could not be proposed, on account of the feebleness and advanced age of the patient. He died two months after his admission. On examining the foot, I found that the articular cartilages had disappeared from the whole of the joints of the tarsus and metatarsus; and that the cells of the bones were filled with purulent fluid. Every tarsal and metatarsal bone was the seat of suppuration through its cancellous tissue*.

Inflammation in the medullary tissue of the Femur and of the Tibia. A boy, 14 years of age, without apparent cause, was suddenly attacked by pain deep in the thigh, and, at the same time, by more severe pain deep in the leg. The whole limb quickly became enormously swollen, from the hip to the ancle. Extensive suppuration ensued in the soft parts around the tibia. Free incisions were made for the discharge of the matter; but the boy became hectic and sank rapidly. On examining the limb, I found a large quantity of matter around the tibia, and that its periosteum had been in great part destroyed. In those situations where portions of the periosteum remained, new osseous substance was deposited upon the bone. Around these osseous deposits, the walls of the bone had extensively ulcerated, and some of its outer lamellæ had perished. Within its medullary tube lymph had been deposited. In the thigh similar changes had taken place, but in a less active form. No matter had formed around the femur; its periosteum was entire, but there were osseous deposits on the bone, and lymph was deposited within its medullary tube.

The history of this case indicated, that inflammation occurred simultaneously in the medullary tissue of the femur and of the tibia, but most severely within the tibia, and here, consequently, the most destructive effects ensued on the surface of the bone and in the soft parts around in†.

The diagnosis of abscess in bone requires particular notice.

The symptoms which belong to the neuralgic affection of bone, and to simple inflammation of its tissue, have, in many instances, so closely

* Museum of St. Bartholomew's Hospital, First series, No. 217, Plate 6, fig. 7.

† Sections of the tibia and femur are preserved in the museum of St. Bartholomew's Hospital, First series, Nos. 51, 52.

resembled those of circumscribed abscess as to render the diagnosis between these disorders a matter of difficulty; and yet it is a diagnosis of much importance, for the right determination of the cases wherein the operation of perforating the bone should be undertaken with the expectation of finding matter within it.

The neuralgic affection of bone has the following special features,—the nervous or hysteric character of the constitutional symptoms—the pain, although severe, yet not confined to a limited district of the bone, and not aggravated by motion of the part, and occasionally attacking the corresponding bone of the opposite limb; further, the pain not yielding to depletory or sedative remedies. On the other hand, the symptoms accompanying the circumscribed abscess in bone are not in general such as bespeak the nervous or hysteric character of the disease; yet upon this distinction we must not too confidently rest. The abscess in bone, especially when occurring in females, has given rise to well-marked nervous local and constitutional symptoms; and if, in combination with such nervous symptoms, there should be, as I have known to occur, thickening and tenderness of the coverings of the bone, it will be really difficult to determine whether the source of pain is exclusively a neuralgic affection of the bone, or whether there is not, at the same time, matter confined within it.

The diagnosis between circumscribed abscess and inflammation of bone, unaccompanied by suppration, is not always well marked. In some instances, simple inflammation, and in others syphilitic inflammation, of bone have so closely resembled the circumscribed abscess as to be mistaken for it. These inflammatory affections, it is true, mostly arise in the shafts of bones, whilst the circumscribed abscess rarely occurs elsewhere than within their articular ends; yet, under the following circumstances, difficulty in the diagnosis has been experienced. Part of the shaft of a long bone has gradually enlarged from inflammation in its tissue; then, upon the occurrence of a fresh paroxysm of inflammation, increased swelling of the bone has ensued with such severity of pain as to have led to the supposition that there must be matter confined within it. But the result has proved the source of suffering to be no other than the tension and stretching of the inflamed periosteum over the swollen bone. The following is the history of such a case, and I have known others similar to it.

A gentleman, about 25 years of age when I first saw him, had been for five years suffering from an enlargement of the shaft of the tibia, presumed from its history to be syphilitic. The swelling was well de-

fined, hard throughout, and of the size of the closed hand. Through the whole progress of the disease, the swelling had scarcely ever been free from pain; but there had been paroxysms of severe pain in it, and each paroxysm was followed by increase of its size. Mercury, iodide of potassium, and sarsaparilla had been largely and long administered: local remedies of every kind had been perseveringly employed, but, from the whole of the treatment, only the remission of pain for a time had been obtained. At length, on the occasion of a paroxysm of suffering with increased swelling of the bone, an incision of considerable length was made through the coverings of the swelling, freely exposing the hard osseous substance of which it consisted. This measure was followed by immediate and complete relief from pain, and there was no recurrence of it. A different view of the nature of this case might have led to the perforation of the tibia, in the expectation of finding matter within it.

TREATMENT OF SUPPURATION IN BONE.

Here the principal consideration relates to the measure of perforating the bone, for the discharge of the matter which is confined within it.

The merit of ascertaining the circumstances which indicate the confinement of a small quantity of matter in a circumscribed cavity within bone, belongs to Sir Benjamin Brodie, who has thereby effected a great improvement in this department of surgery. In several instances, he has been enabled to make a successful application of this knowledge, by perforating the bone, and thus obtaining an outlet for the matter with immediate and complete relief, after which the cavity in the bone has been filled, probably with fibro-cellular tissue, and the wound over it has healed soundly. Limbs have thus been saved which, without such well-applied surgical interference, would probably have been submitted to amputation. The following is an abstract of the evidence which Sir B. Brodie has furnished on this subject.* In a case where the lower part of the tibia had become enlarged, and had been the seat of constant pain for twelve years, when the limb was amputated, a cavity, about the size of a walnut, containing discoloured pus, was found in the tibia, about half an inch above the ancle-joint, with hardening of the surrounding cancellous texture. In another case, the disease had existed more than 10 years in the head of the tibia,

* Observations on Diseases of the Joints, and Lectures on Pathology and Surgery.

which had enlarged, and the pain was most severe. Sir B. Brodie states, "that his attention was directed to a spot about two inches below the knee, to which the pain was especially referred. This part of the tibia was exposed by a crucial incision of the integuments. The periosteum was scarcely thicker than natural, and the bone beneath was hard and compact. A trephine, of a middle size, was applied, and a circle of bone was removed, extending into the cancellous texture, but no abscess was discovered. I then, by means of a chisel, removed several small portions of bone at the bottom of the cavity made by the trephine. As I was proceeding in this part of the operation, the patient suddenly experienced a sensation which he afterwards described as being similar to that which is produced by touching the cavity of a carious tooth, but much more severe, and immediately some dark-coloured pus was seen to issue slowly from the part to which the chisel had been last applied." From this instant the pain ceased, and did not return. The wound healed soundly, and the patient continued well. In a third case, the disease was situated in the lower end of the tibia, and had existed eighteen years. As the symptoms indicated the probability of there being an abscess in the bone, Sir B. Brodie applied a trephine to it, and on removing portions of the cancellous texture with a narrow chisel, about a drachm of pus suddenly escaped from a cavity in the bone. There was no recurrence of pain. The cavity became filled with granulations, the wound cicatrized, and the patient remained perfectly well. To the foregoing, other cases have been subsequently added, in which the operation of perforating a bone, for the discharge of matter from within it, had a successful issue; and it is to be observed that, with one exception, all these cases occurred in either the head or the lower end of the tibia.*

With respect to the mode of perforating a bone for the discharge of matter from within it, but few observations are required. Sufficient exposure of the bone for the application of a small trephine, or other perforating instrument, to its surface, is the first stage of the operation. The selection of the right spot for the perforation is a point requiring the most careful attention. The rule should be, that the chief seat of pain is the spot to be selected; but even when this has been duly observed, the perforation of the bone has been made a few lines in one or other direction away from the abscess. Therefore, when the perforation is continued as deeply as can be done without the risk of pene-

* Lectures on Pathology and Surgery, by Sir B. Brodie, 1846.

trating the opposite walls of the bone, if no matter should appear, it will be right to pierce the cancellous texture with a small perforator around the passage made by the trephine. At the same time, it must be recollected, that the smallest quantity of purulent fluid confined within a bone has been the source of very severe suffering; and that when mixed with the blood, which in general freely escapes from the inflamed cancellous texture around the abscess, the purulent fluid might not be distinctly recognised. The character of the fluid escaping from the bone should, therefore, be closely scrutinized.

Perforation of the outer table of the skull has been performed for the discharge of matter from the diploe. Mr. Abernethy states, that he had seen several cases of suppuration in the diploe, where, the trephine having been early applied, the external table came away within the circle of the instrument; "the matter was discharged from the medullary part of the bone, and the internal table remained sound and entire, covering the dura mater. Granulations soon arose, and the patients got well with the exfoliation only of a portion of the outer table."* I cannot, from my own observation, refer to similar instances of the successful use of the trephine.

In many cases which I have witnessed, injury to the skull in some, and disease of it in others, was followed by such symptoms as suppuration in the diploe might be expected to produce, but they were not sufficiently well marked to warrant the application of the trephine, and the cause of the symptoms was afterwards ascertained to be, not suppuration in the diploe, but inflammation of the membranes of the brain. The application of the trephine, therefore, in such cases, could but have added to the existing mischief. In other cases where suppuration in the diploe had occurred, the outer table of the skull was perforated, but it was of no avail, as the accompanying inflammation in the membranes of the brain proved fatal. I have also known instances where suppuration in the diploe being suspected, the trephine was applied and matter discovered; not, however, in the diplo, but between the bone and the dura mater; and in one case which I examined, the matter appeared to have formed upon the dura mater, and to have passed through a fissure in the inner table of the skull to the diploe, which it pervaded to a considerable extent.

When, in cases of suppuration in the diploe of the skull, the accompanying inflammation in the membranes of the brain does not destroy

* Surgical Observations, Vol. ii.

life, necrosis of the outer table at the seat of the abscess will probably ensue, forming a complication of disease that is usually of slow progress, and uncertain result. Constant pain in the head, with paroxysms of severe suffering usually occur in these cases; and frequently each paroxysm is followed by extension of the disease to a fresh portion of the skull, indicated by inflammation in a fresh portion of the scalp, and by the elevation of it into a soft puffy swelling. I have known cases of this kind to endure for years, not admitting of other aid from surgery than a soothing treatment, with the occasional removal of loose pieces of the dead bone. But such a case is often suddenly brought to a fatal termination, by an attack of inflammation in the membranes or substance of the brain, of which I have seen several instances. Active surgical interference in these cases cannot be safely employed. No measures of an irritating character can be resorted to, for the object of expediting the exfoliation of the dead bone, from the risk of exciting inflammation in the brain; and, for the same reason, no attempt should be made to remove the dead bone until its looseness indicates that its separation from the living bone is completed. It is true, that the presence of a necrosed portion of the skull is accompanied by the hazard of fatal inflammation in the brain, even when no other than the most soothing treatment has been employed. In the museum of St. Bartholomew's Hospital there are two examples of abscess in the anterior lobe of the brain, from individuals in whom an almost sudden termination of life occurred whilst portions of the frontal bone were slowly exfoliating. Nevertheless, in such cases, we are bound to wait until the exfoliation of the dead bone is completed.

CHAPTER V.

ON CARIES, THE CONDITION OF BONE ENSUING FROM SUPPURATION IN ITS CANCELLOUS TEXTURE.

I PASS from the history of suppuration in bone to the consideration of peculiar changes in its cancellous texture, which it is intended to comprise in the term caries.

The term caries is often employed to designate ulceration of bone, whether arising from simple inflammation or from malignant disease. It is also used to designate a peculiar organic change in bone, which consists in a crumbling or mouldering of its substance: in the museum of St. Bartholomew's Hospital* there is a tibia, a portion of the shaft of which is converted into a soft and crumbling yellowish substance; and I have been accustomed to consider this as an example of the condition of bone from which some of the ancient writers probably derived their description of caries. But I purpose here to express by the term caries the changes which, under certain circumstances, are consequent on chronic suppuration in the cancellous texture of bone.

Caries is distinguished into the simple, scrofulous, syphilitic, and phagedenic varieties. To these distinctions there may be no objection, as suppuration in the cancellous texture of bone, and the consequent changes in it, comprised in the term caries, do occur in the progress of these several diseases. And in this view of the nature of caries, its ordinary causes readily suggest themselves: it ensues from comminuted fractures of the cancellous texture, or from such injuries as the crushing of this texture by a bullet; it also ensues from the influence of the scrofulous diathesis, and from the action of the syphilitic poison: and there are instances of caries not referable to any distinct cause.

Caries exhibits in its progress the following phenomena. Inflammation extending from the bone to its investing soft parts, these become

* First series, No. 78, Plate 4, fig. 4.

swollen, thickened, and tender; and abscesses are formed in them, which contract into fistulous passages leading to the diseased bone. The periosteum covering the diseased bone becomes thickened, very vascular, and readily separable from it. The bone itself is at first very vascular, then its cells become filled with a reddish-brown fluid, apparently a mixture of blood and pus, and occasionally combined with oily particles. Absorption of the bone, but chiefly of its animal part, ensues; that which remains is porous and fragile, and of a grey, brown, or black colour, probably from decomposition of the matter within its cells; to which cause, likewise, the fœtid odour of the matter discharged through the fistulous passages may be ascribed. The diseased bone may gradually disappear, either by ulceration, or by its discharge in fragments through the fistulous passages in the surrounding soft parts. Ulceration, in some instances, commences within the bone, hollowing it out, and reducing it to a thin shell; in others, ulceration commences in the outer surface of the bone, and extends progressively inwards. Whilst these changes are in progress, granulations, very loose and spongy, and bleeding on the slightest touch, often arise from the diseased bone, filling the cavities in its interior, and protruding through the fistulous passages in the soft parts covering it.

The phenomena just described occur most frequently and most distinctly in the caries of bones composed wholly of cancellous texture; but they are also observed in long and in flat bones; and among the former, most frequently in the tibia. In bones that are deeply situated, caries is often accompanied by very little evidence of inflammation, either in the bone or in its investing soft parts. Thus the scrofulous caries of the spine often advances to the destruction of the bodies of many vertebræ, without tenderness in the bones or in the soft parts investing them.

Upon the diagnosis of caries from circumscribed abscess in bone, and from internal necrosis, the following observations have occurred.

Circumscribed abscess is rarely followed by the formation of a fistulous channel in the walls of the bone and adjacent soft parts, affording outlet to the matter. But in caries, and in internal necrosis, such a channel is almost invariably formed in the walls of the bone and their investing soft parts; through which channel, in caries, matter is discharged from the diseased bone; and in necrosis, from the inflamed cancellous texture around the dead bone.

Between caries and internal necrosis there are no distinctive external characters: both being followed by the formation of a fistulous

channel in the walls of the bone, and both being accompanied by pain in the bone, continuing so long as the source of irritation, which is the carious or dead bone, exists. Practically, the diagnosis between caries and internal necrosis is of no moment, as the object of treatment in each is the same—the removal of the diseased, or dead bone. Moreover, caries and necrosis often exist together in adjacent portions of bone, as in the instances where suppuration ensues in the cancellous texture adjacent to dead bone. The portion of bone which has been long carious often perishes, and thus the caries becomes changed into necrosis. Such are the circumstances which lessen the value of a diagnosis of these affections by their external characters.

TREATMENT OF CARIES.

Inflammation precedes suppuration and the consequent disorganization of the cancellous texture of bone which constitute caries. But the inflammatory action is mostly of a languid character, not, therefore, likely to be arrested by depletory remedies: such remedies are, however, serviceable by diminishing the inflammation of the soft parts around the diseased bone.

There are natural processes of cure of carious bone. It may separate into minute fragments, and be thus discharged through the fistulous passages in the adjacent soft parts; or when separated from the healthy bone, the carious bone may remain loose in a suppurating cavity, the walls of which are formed by the surrounding bone, or in part by the soft tissues adjacent to it. The loose and carious bone enclosed within this cavity becomes an irritant to the surrounding parts, exciting pain in them, and maintaining a purulent discharge from them. Such are the circumstances under which the question often arises—whether measures should be taken to effect the removal of the carious bone. But the propriety of an operation in these cases is often doubtful, from the following circumstances:—There may be difficulty in ascertaining the extent of the caries, as the thickening and consolidation of the surrounding soft parts often extend much beyond the disease in the bone. Again, when caries attacks a bone so large as the os calcis or astragalus, it may be impossible to determine whether part or the whole of the bone is affected. The number and situation of the fistulous passages in the surrounding soft parts are not decisive evidence on this point. One portion of the carious bone loose in its suppurating cavity, may be readily discovered by a

probe; whilst another portion of it, not yet separated from the sound bone, may have no fistulous passage leading to it. When caries attacks a bone which, like the astragalus, is wedged between the adjacent bones, and surrounded by articular surfaces, it is difficult to determine whether the disease is confined to it, or has extended to the adjacent joints and bones. So with respect to the cuneiform bones; when one of these is the seat of disease, it is often difficult to decide whether or not the disease has extended to the adjacent tarsal and metatarsal bones.

Similar considerations apply to another combination of disease, often not distinguishable from caries, and of not infrequent occurrence, especially in the tarsus, namely, circumscribed abscess and internal necrosis. Such a case presents the same thickening of the surrounding soft parts and fistulous passages in them as are observed in caries. I had in St. Bartholomew's Hospital, at the same time, three cases of disease in the bones of the tarsus: one, abscess and necrosis in the os calcis, consequent on the perforation of it by a nail; another, abscess in the head of the astragalus; and the third, an instance of suppuration through the cancellous texture of the middle cuneiform bone. And in all these cases the question was carefully considered, whether it would be expedient to undertake the removal of the diseased bone; but the uncertainty of the nature and extent of the disease was in each case decided to be a sufficient ground for preferring amputation just above the ancle-joint.

Most of the operations for the removal of carious bone occur in the hand or foot; and in the performance of them, we are to be guided by the principles observed in the treatment of the mutilations of these parts by violence. We know the importance, in such cases, of preserving a single finger with the smallest portion of the palm of the hand for its support. So in operating on these parts when diseased, it is desirable to remove no more than the bone which is actually unsound. In the foot, the largest and most important of its bones, the astragalus, and the os calcis, have been severally taken away with less injury to its powers and actions than might be expected. Even after the loss of the entire os calcis, the tread and the walk will still be firm and secure, though wanting, of course, the lightness and spring derived from the action of the muscles of the calf upon the heel.

Incisions through the soft parts over carious bone are of use in affording free outlet to the matter, and thus checking its diffusion through the bone. Local applications to carious bone should be of a

soothing nature. Stimulant remedies applied to it will not have the effect either of arresting the caries or of restoring soundness to the bone; and in proportion to the degree of excitement such remedies occasion, will be the risk of their producing fresh attacks of inflammation in the bone, and thus extending the caries.

There are cases of caries not suited for any operative proceeding for the removal of the diseased bone, either because the patient is too far advanced in life, or on account of some peculiarity of constitution prohibiting it. Under such circumstances, the mischiefs incidental to the continuance of the disease are, attacks of severe pain in the bone and inflammation in the periosteum, whenever obstruction occurs to the free escape of the matter from the carious bone: this is likely to happen in instances of caries in the cancellous texture of the tibia, where the walls of the bone have become thickened, and the fistulous passage in them leading to the carious bone is so narrow as not to afford free outlet to the matter. For such a condition of disease a counter-irritant will be of no avail; reliance must be had on depletory and sedative remedies, local and constitutional, for the relief of the pain in the bone; especially on the use of iodide of potassium as the means of arresting the inflammation in the periosteum covering the diseased bone. I attended an elderly gentleman who had suffered more than twelve years from caries in the upper part of the shaft of the tibia; and who, through this long period, had numerous attacks of severe pain in the diseased part of the bone, and of inflammation in the surrounding periosteum; these attacks recurring whenever the matter ceased to flow with its usual freedom through the narrow fistulous channel in the walls of the tibia. Abscesses, often of large extent, had again and again formed in the parts adjacent to the diseased bone; but of late years, by directly resorting to the use of iodide of potassium, he generally succeeded in arresting the inflammation of the periosteum at its commencement, thereby saving himself the suffering and destruction of parts incidental to extensive suppurations.

But in order that a carious bone may endure without extension of the disease, and without mischief to the adjacent parts, it is essential that these should be maintained in the strictest quietude. For this object, if the caries is situated in the tibia, an almost entire disuse of the limb is necessary. In the case just mentioned, of caries in the shaft of the tibia, which had endured many years, the limb was, on a particular occasion, used more freely than usual; this was directly followed by increased pain in the bone, and by acute inflammation

within it, occasioning necrosis of its cancellous texture, extending through the head of the tibia to its upper articular surface. Consequently, the matter formed around the dead bone escaped into the knee-joint, causing suppuration within it. A free incision into the joint gave vent to a large quantity of matter; but beneath this accumulation of disease the patient, of an advanced age, sunk. Mr. Lawrence attended this gentleman through the latter stage of his disease, and he communicated to me the foregoing particulars respecting the mode of its termination. He obtained the examination of the limb, and found that a large portion of the cancellous texture of the head of the tibia had perished, and was separated from the walls of the bone, and that the ulcerated cavity around the dead bone communicated above with the knee-joint, the cartilages of which were completely destroyed.

CHAPTER VI.

ULCERATION OF BONE.

"There is, I believe," Mr. Hunter observes, "no difference between the ulceration of soft parts and of bone*." Although it is difficult to obtain clear evidence of a process in bone agreeing with the definition of ulceration by Hunter, namely, "absorption attended with suppuration†," yet, looking to the organic constitution of bone, we find, even in its compact tissue, the conditions essential to ulceration. Bone is certainly liable to a destructive process analogous to the ulceration of soft parts, and the varieties of ulcer in bone are as distinctly marked as they are in other tissues.

The ulceration of bone which is the effect of simple inflammation in its tissue usually begins at a single point, and spreads equally in width and depth‡. When, however, the ulceration is consequent on inflammation of the periosteum, it spreads widely over the surface of the bone, but does not, in general, deeply penetrate its substance.

Syphilitic ulceration of bone usually begins at many points, distinct, yet close together, giving to the surface of the bone a worm-eaten appearance§.

Malignant ulceration of bone is generally irregular in its outline and surface; and it extends, in a manner to form excavations in the bone of unequal length, width, and depth, with sharp overhanging margins||.

The surface of ulcerated bone is rough and porous, except in the instances where its texture had been previously hardened by inflamma-

* Lectures on the Principles of Surgery.
† Treatise on the Blood, Inflammation, &c.
‡ Plate 4, fig. 3.
§ Plate 4, fig. 1.
|| Plate 4, fig. 2.

tion. Around the ulcer of bone, from simple inflammation, its texture becomes expanded and hardened*, with changes analogous to thickening of the tissues around an ulcer in soft parts. Also, around the ulcer of bone from simple inflammation, osseous deposits occur in the periosteum, in the form of tubercles and spines, which, when of considerable extent, unite into rock-like masses of osseous substance. The syphilitic, scrofulous, or other specific ulcer of bone, is not accompanied by these changes, either in the surrounding periosteum or bone†.

Ulceration of bone occurs as a distinct and primary disease; it is thus recognized in the vertebræ, also in the articular surfaces of bones, more especially in the head of the femur; and it here constitutes a peculiar disease of the hip-joint, of which the following are the principal features.

It occurs, I believe, only in adults; rarely, if ever, in females. Often it is traceable to local injury; in many instances, to rheumatism; but in some cases there has been no apparent cause of the disease. Its chief symptoms are, a sense of weakness and uneasiness, scarcely amounting to pain, in the hip-joint. Thus the disease has endured for months, even for years, advancing very slowly, and with so little distress to the joint, that, throughout, the strength and movements of the limb have been but little impaired. At length, shortening and eversion of the limb ensue from the destruction of part of the head of the femur.

Many times, in examining the adult hip-joint, I have found that the ligamentum teres and articular cartilage, with part of the osseous substance of the head of the femur, had disappeared; and that, in some instances, both hip-joints were similarly altered. These, it is probable, were examples of this ulcerative disease attacking the head of the femur: and it is proved, by the observation of cases, that a hip-joint which has suffered these changes to the extent here stated may, upon the cessation of the disease, still be free and strong in its movements. But in some cases, so large a part of the head of the femur has been removed, that the small portion of it which is left will not remain in

* Plate 4, fig. 3.

† Weidman, in his treatise, De necrosi ossium, has given the following good summary of the characters of ulceration of bone from simple inflammation: Locus ulcerosus, scaber, excavatus, in quo contextus ossis spongiosus apparet patulis ubique ossium cellulis. Textus osseus novus circum partem ulceratam enatus, et primigeno superadditur, varie tuberculatus, orificiis plurimis refertus, magnitudine diversis, quæ in canaliculos recipiendis vasis inservientes ducunt. [Explicatio tabulæ primæ.]

the acetabulum: it passes out of the cavity, and at the same time the capsule of the joint yields, and is elongated; these changes being accompanied by considerable shortening of the limb and lameness, which must be permanent. In the following case the features of this disease were well marked.

Ulceration of the head of the Femur. A cavalry officer, aged sixty-three years, who had seen much active service, requested me to examine his limb, on account of the very gradual shortening of it; to relieve himself from the inconvenience of which he had added half an inch to the thickness of the heel of his boot. I found by careful and repeated measurement, that the limb was shortened to the extent of an inch. He stated that he had not suffered from rheumatism or gout; that he had met with no accident; but that, about seven years ago, without apparent cause, he began to feel uneasiness in the hip-joint; which had continued, with variations, to the present time. The shortening of the limb had been in progress about six months; and it appeared to be still increasing. In the morning he was unable to move the limb from the stiffness of the hip-joint; but, by continued efforts through the day, he became gradually enabled to walk with the help of a stick. Every variety of treatment had been fully and perseveringly tried: the impression on the mind of the patient was, that the disease in his hip-joint had been wholly uninfluenced by remedies*.

Ulceration of the articular surfaces of bones in an active form occurs in the advanced stage of the inflammatory diseases of joints. Here the destruction of the bones is accompanied by severe pain; and it will advance, unretarded by remedies, so long as there is any movement of the ulcerated surfaces upon each other. Even the movement of an ulcerated bone upon soft parts is very painful and disturbing to the system. Such appears to be the source of the suffering endured in instances of disease in the hip-joint, followed by displacement of the ulcerated head of the femur from the acetabulum; for, in such cases, it is proved by experience, that immediate and complete relief from pain and constitutional disturbance follow the removal of the ulcerated bone†.

* On this affection of the hip-joint, observations are recorded by Mr. Gulliver, which have the merit of originality, as the facts comprised in them had not before been distinctly noticed. Edinburgh Medical and Surgical Journal, Nos. 128, 129, Vol. xlvi.

† Case of Excision of the Upper end of the Femur in an example of Morbus Coxarius, by W. Fergusson, Professor of Surgery in King's College, Medico-Chirurgical Transactions, Vol. xxviii.

The reparation of ulcerated bone is effected in the following ways.

When an articular surface of bone is the seat of ulceration, upon the subsidence of the diseased action, the Haversian canals in the exposed bone may become filled with earthy matter, giving it such a smoothness, polish, and hardness as to fit it for the utmost freedom of motion. Such a restorative process is met with in joints of all sizes.

Reproduction of the cancellous substance removed by ulceration from the articular portions of bones, does, under favourable circumstances, take place; but it is accompanied by the growing together or consolidation of their opposite surfaces. From these surfaces, granulations are thrown forth which ossify. But the production of this osseous anchylosis in a large joint is a very slow process, requiring not less than two years for its completion; it is never effected but in early life, and when there is full vigour of the vital powers. Immobility of the parts is essential to its production; for, without this, abundant granulations may arise from the ulcerated bones, but the ossification of them will not ensue.

Reproduction of the compact substance of bone removed by ulceration does not, I believe, ever occur. There have been instances of ulceration extending through a large portion of the shaft of the tibia and in its entire thickness; yet, upon the healing of the ulcerated surface, the leg still retained its shape, and was sufficiently strong to sustain the weight of the body. But in examining such limbs, I have found that the vacant space in the tibia was filled by dense fibro-cellular tissue; and that the strength of the limb was derived from increased thickness of the fibula, and ossification of the inter-osseous ligament uniting it to the tibia.

TREATMENT OF ULCERATION OF BONE.

On this subject but little can be stated. In the treatment of ulcerated bone, the obvious indications are to prevent the extension of the disease, and to promote the reparative processes which belong to it.

The best local remedies generally applicable to an exposed surface of ulcerated bone are those of a soothing nature; but in some cases astringents and mild stimulants are serviceable for the object of promoting the growth of healthy granulations from the bone. Strongly stimulating applications to ulcerated bone are objectionable, as they are likely to excite fresh attacks of inflammation in the bone; and

thus they may be the means of changing the character of the disease, by giving rise to caries or necrosis in the ulcerated bone.

It is not to be doubted that a powerful counter-irritant, as the moxa or caustic issue, applied to the integuments over a joint the bones of which are ulcerated, can arrest the ulcerative process. It may be considered difficult to obtain evidence of this; but it is certain, that in ulcerative disease of the bones of the spine, as also in joints, a powerful counter-irritant will get rid of the severe pain which characterizes the ulceration of bone in its active form.

PHAGEDENIC ULCERATION OF BONE.

There is a form of widely-spreading and, as I believe, incurable ulcer in bone, so well defined in respect to its mode of origin, characters, and progress as to deserve especial notice.

The tibia is most frequently the seat of this disease, probably because it is most exposed to injuries by violence, to which the disease can in general be traced. The instances which I have seen of it occurred in men who had passed the middle period of life, and were of intemperate habits. The local injury was followed by successive abscesses and ulcerations in the soft parts, spreading to the periosteum; and thence the ulceration extended through the bone. Hard wart-like granulations arose from the ulcerated surfaces of the soft parts and of the bone; but these granulations had no disposition to cicatrize, and they discharged very profusely a thin fœtid fluid. In this state I have known the disease to continue many years without the slightest effort of reparation. It is, however, but a local malady, not contaminating the absorbent glands, nor affecting the general health. Therefore, in these cases, objection need not be urged to the removal of the limb, in the apprehension that malignant disease will arise elsewhere. The following are examples of this disease.

Phagedenic Ulcer in the Tibia. A man, aged fifty-three, was admitted into St. Bartholomew's Hospital, with a large foul ulcer in the front of the leg, penetrating the tibia. Thirty years previously, a heavy piece of timber fell upon his leg, which was followed by abscess and ulceration of the soft parts. After some time the diseased parts became apparently sound, and continued so for twenty years, when the same part of the leg was again severely injured. Abscess again formed, followed by ulceration, which extended through the soft parts to the tibia, and then gradually through the bone, destroying a portion of its shaft. Thus a large hollow was formed in the front of the leg,

from which a profuse fœtid watery discharge constantly issued, and the margins of this hollow were formed by very vascular, large, hard, wart-like granulations. When every means had been ineffectually tried to obtain a reparative process, the limb was amputated. On examining it, I found the principal arteries ossified; and that the ulceration, having extended completely through the tibia, had advanced some way into the fibula. The ulcerated surface of the bone presented small circular hollows, of unequal depth, with sharp overhanging borders*.

Phagedenic Ulcer in the Tibia. In the year 1805, at the battle of Trafalgar, a sailor received a blow on the front of his leg. Ulceration of the soft parts ensued. The ulcer healed, but there remained a constant aching in the bone. Several years afterwards, ulceration recurred in the same parts, and it then extended into the tibia. In the year 1818, he was admitted into St. Bartholomew's Hospital, with a wide and deep ulcerated hollow in the front of his leg. The surface of this hollow was formed by large and hard granulations, from which a profuse thin and fœtid discharge constantly issued. The limb was amputated, and, on examining it, I found that four inches of the tibia, in nearly its whole thickness, had been removed by ulceration, and that the remaining portion of the shaft of the bone was much thickened and indurated.

Phagedenic Ulcer in the Tibia. A man, seventy years of age, was admitted into St. Bartholomew's Hospital, under the care of Mr. Earle. He stated, that ten years previously he began to suffer severe pains in his limbs, which were considered rheumatic, and that soon afterwards, the bones of his legs, thighs, and arms began to enlarge; that two years previously he received a blow on the front of the left leg, which was followed by abscess and ulceration in the soft parts, extending through the periosteum and deeply into the substance of the bone. From these diseased processes, the limb had been the source of such constant suffering that he solicited its removal. On examining the limb, I found the shaft of the tibia enormously enlarged, and indurated throughout, with a deep chasm in its lower and front part, occasioned by the ulceration of the thickened bone. Above and below this chasm, the medullary tube was closed for some way by osseous deposit; but beyond this, the tube was free, and the medulla within it healthy. The inter-osseous ligament was ossified throughout, and the fibula was much increased in thickness.

* Museum of St. Bartholomew's Hospital, First series, Nos. 29, 30, Plate 4, fig. 2.

Seven weeks after the amputation, the man died suddenly, and, on examining his body, an ulcer was found in the stomach, penetrating its coats, through which its contents had escaped. The tibia of the opposite limb, both thigh bones, and all the long bones of the upper limbs were greatly enlarged and indurated.

The peculiar ulceration of bone described in the foregoing cases, is analogous to certain examples of ulceration in the skin and subjacent soft tissues, spreading widely and deeply, and presenting such peculiarities of character, that it is often regarded as carcinomatous.

CHAPTER VII.

NECROSIS.

Necrosis is the term applied to the death of bone during the life of the rest of the body. Bone, retaining an apparently healthy texture, may simply lose its vitality, or it may have previously undergone change of structure from disease. In the former case, the bone presents no alteration, except what is owing to the stoppage of the circulation of blood through its vessels; but in the latter, the condition of the bone varies with the nature of its previous disease. Necrosis of the shaft of a long bone, in the ordinary mode of its occurrence, is an example of the simple death of bone without change in its structure; but when necrosis has been preceded by chronic inflammation, the dead bone will be hardened; or, after other diseased changes, it may be soft and fragile.

Dead bone usually presents a yellowish white colour, consequent on the blood being withdrawn from its vessels: but it often becomes of a brown or black colour. This change has been attributed to the decomposition, either of blood or purulent fluid, in its tissue; but the brown or black colour is often seen in dead bone so situated that purulent fluid would not readily penetrate it, as, for example, in the most convex part of the frontal bone. The colour of dead bone appears to be influenced by its exposure to the atmosphere; thus it is often brown or black only to the extent that it is uncovered. The colour of dead bone changes in the following manner: first, dark points appear in it; then these increase in number and coalesce, rendering the whole surface brown or black; but the change of colour does not extend below the surface of the bone, except in the instances of its texture being very porous.

Necrosis occurs less frequently in the cancellous than in the compact

tissue of bone ; the former, by its greater vascularity and vital endowments, resisting the influence of causes which give rise to necrosis of the compact tissue. Hence, gangrene of the cheek (cancrum oris, noma) extending from the soft parts to the bones, frequently occasions necrosis of the lower jaw, and but rarely of the upper. I have, however, seen an instance of gangrene of the cheek followed by necrosis and exfoliation of the entire superior maxillary bone. And it is owing to the resisting power in the cancellous texture of bone, that necrosis in the shaft of a bone rarely extends to its articular ends. There are, however, in the museum of St. Bartholomew's Hospital, instances of necrosis involving the articular ends of the tibia.

With respect to the liability of different bones to necrosis, it may be observed, that necrosis occurs more frequently in the shaft of the tibia than elsewhere, apparently because its front part, from the thinness of its coverings, is especially exposed to such noxious influences as are likely to occasion the death of the bone. Next to the tibia is the femur in the frequency of its necrosis, and why it should be so is not evident. After the femur, the other principal bones may be thus arranged, in respect to their liability to necrosis: the humerus, flat cranial bones, lower jaw, last phalanx of a finger, clavicle, ulna, radius, fibula, scapula, upper jaw, pelvic bones, sternum, ribs.

Necrosis is of frequent occurrence in the cancellous texture of the head of the tibia. There appears, indeed, to be something in the structure and function of the head of the tibia especially disposing it to the invasions of disease ; for here, not only necrosis, but also abscess, is frequent ; and here, also, the malignant affections of bone are frequently developed.

Causes of Necrosis. The recognized causes of necrosis are—cold, injury by violence, rheumatism, scrofula, syphilis, fever. Some of these causes act directly on the periosteum ; others, on the medullary tissue ; and others, on the bone itself. A boy was occupied many hours in drawing a truck through deep and melting snow. On the next day he suffered severe pain in his leg, and in a few days afterwards, suppuration ensued through the soft parts of the leg, and it became evident that the tibia had perished. Here it is probable, that the periosteum, medullary tissue, and bone, were all alike attacked by inflammation, and that the death of the bone was the consequence. The severest form of paronychia, which is followed by necrosis of the last bone of the finger, probably commences, as Dr. Crampton has suggested, in

inflammation of the periosteum*; and there are instances of necrosis, preceded by inflammation of the periosteum, clearly denoted by the history to be rheumatic. During the progress of fever, necrosis of the shaft of a long bone has occurred without any evidence of previous inflammation, either in the periosteum or medullary tissue. And here it might be suggested, that the inflammation and death of the bone are analogous phenomena to the local congestions and inflammations occurring, under similar circumstances, in other organs. In a young female, necrosis of the entire shaft of the tibia occurred during an attack of fever, from which she died in about a month from its commencement. I found the tibia throughout its osseous substance of a deep red colour, whilst the medullary tissue was unaltered. But that the bone had perished was evident, by the entire separation of the periosteum from it, and by the lines of separation commencing between the shaft and articular ends. Here, therefore, it appeared that inflammation in the tissue of the bone had preceded its necrosis.

There are instances of necrosis, affecting a portion or the entire shaft of a bone, not traceable to any distinct cause. An individual in good health may be suddenly attacked by severe pain in the thigh, leg, or arm; and this, in a few days, may be followed by suppuration deep in the limb, the consequence of the death of the bone. A large portion of the lower jaw, in young persons, occasionally perishes without any previous derangement of health, local injury, or other apparent cause. But in some cases, an aching in the bone has preceded the death of it. Such examples of necrosis usually occur in early life, between the fourth and the twentieth years, but rarely later. In the same order of cases are the instances of necrosis attacking two bones simultaneously in the same limb, or in distant parts of the body.

The detachment and removal of periosteum will, it is true, deprive the subjacent surface of bone of part of its nutrient vessels; yet there may be no necrosis, even of the outer lamellæ of the bone. When, however, the periosteum is detached with so much violence as to injure the circulation in the vessels of the bone, then, it is probable, that the surface of the bone will perish.

Necrosis of the upper or lower jaw is, in most cases, but not invariably, the effect of some local cause acting on the adjacent soft parts, and hence on the periosteum and bone. I had, in St. Bartholomew's Hospital, a man, about thirty years of age, in whom, without apparent

* Dublin Hospital Reports, Vol. i.

cause, necrosis occurred in the entire front and ascending portions of both superior maxillary bones. His statement was, that about twelve months previously, he began to suffer pain in his upper jaw; soon after which, the teeth fell out of their sockets, and matter was discharged into the mouth. When the dead bone was sufficiently loosened, I drew away the entire front of each maxillary bone with its alveolar process: after which, the surrounding parts healed soundly, but with the permanent hollow in the face resulting from the loss of so large a portion of its bony fabric. And this consequence of necrosis of the superior maxillary bone may always be expected; since, under whatever circumstances the necrosis has occurred, it is not, as I believe, ever followed by the slightest reproduction of the lost bone.

Necrosis in a portion of the lower jaw, especially of its alveolar process, is occasionally preceded by symptoms of scurvy; namely, swelling and sponginess of the gums, with bleeding from them, and much derangement of the general health. But the more frequent cause of necrosis in the lower jaw is excessive salivation, when the inflammation in the mucous membrane of the mouth extends through the subjacent tissues to the periosteum of the jaw. I have seen an instance of necrosis in nearly the whole body of the lower jaw, in a case of fever, in which only a few grains of calomel had been administered. Yet it was followed by excessive salivation and severe inflammation in the gums and cheeks*.

Another cause of necrosis in the jaws, both upper and lower, has of late years come into operation, in the manufacture of lucifer-matches. Whilst the matches are being dried, a large quantity of phosphorous acid vapour is given off from them, with which the air of the drying-rooms becomes charged. Many of the persons employed in these rooms, and, consequently, exposed to the noxious vapour for several hours in the day, have been attacked with necrosis of large portions of the upper or lower jaw; and, in some instances, of both jaws. A notice of this peculiar form of necrosis has been published by Dr. Heyfelder†. In the first case which he saw, he removed a portion of the lower jaw, and the patient, a female, returned well to her occupation: but a few months afterwards she came again to the hospital, with necrosis of the other half of the lower jaw, and also of the upper

* Museum of St. Bartholomew's Hospital. First series, No. 102.

† Medicinische Zeitung. Berlin, November, 1845. There is alsó a Memoir on Necrosis of the Jaw Bones in consequence of the action of Phosphorus, by F. W. Lorindser, Chief Surgeon of the district infirmary of Wieden, in Vienna.

jaw, and she died in a hectic state, after undergoing the disarticulation of the second half of the lower jaw. The other cases which occurred to Dr. Heyfelder, were all in women occupied in the phosphorus-match manufactories at Nürnberg; and in most of them one half of the jaw became affected. Dr. Heyfelder states, that the disease in the jaw appeared not to be simple necrosis; the outer surface of the portions of bone which he extracted, being covered with a thick layer of grey pumicestone-like, newly-formed, osseous substance. He also refers to some lower jaws in the possession of Dr. Dietz, of Nurnberg, which are completely covered with a thick layer of grey, newly-formed, osseous substance. In all but one of these bones, also, necrosis had taken place.

Similar affections of the jaws have occurred among the lucifer-match manufacturers of this country. In the London Hospital there have been several of these cases, from the lucifer-match manufactories in the neighbourhood. Through the kindness of Mr. Luke, I had the opportunity of seeing one of the patients: he was a young and very sickly-looking man, with a large swelling of the soft parts on the right side of the face, and fistulous holes just below the lower jaw, through which the probe passed upwards to dead bone; but it did not appear that the formation of any new bone was in progress. This man had been employed in cutting the lucifer-matches previous to their arrangement in boxes; during which proceeding, he stated, that frequently a large number of the matches ignited, and that, in this way, he had been exposed to the noxious vapours arising from them. We further learned from this patient, that several persons had discontinued the occupation on account of ill health, without suffering disease in their jaws.

Some cases of disease in the lower jaw, in lucifer-match manufacturers, have been in St. Bartholomew's Hospital, and from these patients I obtained a history of the disease, similar to that which had been recorded by the German physicians, who were the first to observe it.

It seems well ascertained that the disease is the result of long exposure to the fumes of phosphorous acid, giving rise to inflammation of the periosteum of the jaw, in conjunction with extreme depravation of the general health. It has been suspected that the disease was owing to the use of arsenic in the manufacture of lucifer-matches; but to this notion it has been properly objected that the smelters of arsenic are liable to no such malady; and it is certain that the disease occurs in lucifer-match manufactories where no arsenic is employed.

With loss of appetite, sallow countenance, and feeble circulation, the first indication of the disease is usually tooth-ache, followed by the dropping out of the teeth, more especially of the grinders, and then by the death of a portion of the jaw, with its attendant evils of fœtid discharge into the mouth, abscess and fistulous passages in the adjacent soft parts. There can be no doubt of the disease being the result of exposure to the fumes of phosphorus; it may be a question, whether the fumes act as a local excitant upon the periosteum and bone of the jaw, or whether the disease in the jaw occurs secondarily, as a consequence of the circulating fluids being poisoned by the inhalation of the phosphorus. Against the opinion that the phosphoric vapour acts merely as a local excitant, the objection has been urged, that it produces no effect on the periosteum of the bones of the nasal passages through which the vapour is directly inhaled.

Whichever may be the mode of production of the disease, its effects upon the jaw are certain in destroying a portion of it, and under such circumstances that no reproduction of the bone will ensue. For here, there is a total want of the essential conditions for the reproduction of bone, namely, inflammation in healthy structures with health in the general system. The grey pumicestone-like osseous substance deposited in these cases from the inflamed periosteum of the jaw, is to be regarded as a peculiar morbid product from a diseased tissue.

Many years ago, Dr. Roupell placed in the museum of St. Bartholomew's Hospital* several bones from cows obtained from Swansea, in the neighbourhood of which there are copper-works, where, in melting the copper ore, arsenical fumes are disengaged to such an extent as to destroy all animal and vegetable life within their influence. The animals, soon after their exposure to these fumes, become ill and disabled, from disease in their bones, which, on examination, are found enlarged, and covered by deposits of unhealthy osseous substance. Here, therefore, it would appear that, in animals, the arsenic, contaminating the circulating fluids, had, through these, excited inflammation of the periosteum and bones, of a somewhat similar character to the disease which occurs in the jaws of persons occupied in the manufacture of lucifer-matches.

There are numerous instances of necrosis attacking small portions of bone, some of which seem to require especial notice.

* First series, Sub-series A. No. 156.

One of the most frequent of these is necrosis of the tuber ischii, or of the trochanter major, with the destruction of their soft coverings, in feeble systems, from inability to sustain the pressure to which the parts are subjected.

In scrofulous children, necrosis occurs in portions of bones having a cancellous texture; but, in these instances, the death of the bone is usually preceded by suppuration through its cells.

Syphilis produces its effects mostly upon the compact osseous texture, and in portions of bones which have thin soft coverings, as the flat cranial bones, the front surface of the tibia, and the posterior border of the ulna, near the olecranon. One of the modes of action of the syphilitic poison is to produce the immediate and complete death of the surface of bone it attacks. A circumscribed puffy swelling then arises in the investing soft parts, and, in the centre of this swelling, an ulcerated hole speedily forms, leading to the dead bone.

Rheumatic inflammation of periosteum is another cause of necrosis in small portions of bone. This occurs most frequently in the periosteum of the trochanter major, and adjacent parts of the neck and shaft of the femur; and it here constitutes a disease which is, in some cases, very tedious and difficult to manage, from the impossibility of getting at the dead bone without the risk of injury to the hip-joint, and often formidable, in consequence of the hip-joint having become implicated in the inflammatory processes adjacent to the dead bone. In the two following cases, the features of this disease were well marked.

Necrosis of the Trochanter Major, from rheumatic inflammation. A youth, about sixteen years of age, who had been much exposed to a cold and wet atmosphere, was admitted into St. Bartholomew's Hospital, suffering from acute inflammation in his hip-joint, which had been preceded by pains in other joints. Mercurial ointment was plentifully applied to the circumference of the inflamed joint; calomel and opium, with antimony, were also administered, and these remedies were continued to the extent of producing salivation, when the inflammation in the joint began to subside, and it continued to do so without further treatment. He left the hospital with the perfect use of the joint. About three months afterwards, an abscess formed directly over the trochanter major; it burst, and a piece of bone, the size of a horse-bean, was discharged from it, after which the abscess closed and healed soundly. The exfoliated bone appeared to have been part of the trochanter.

Necrosis of the Trochanter Major and Base of the Neck of the Femur, from rheumatic inflammation. In a female, twenty-seven years of age, the disease, commencing with symptoms of rheumatism, had been seven years in progress, and it had, for almost the whole of this time, incapacitated her from active occupation, the hip-joint having become fixed, either by the adhesion of its articular surfaces, or by thickening of the tissues around it. Three fistulous passages had formed at the upper and outer part of the thigh, which, when examined by a probe, were found to converge to the front of the neck of the femur, but no loose or bare bone could be detected, and, as it was thought, in consequence of the probe not following the tortuous and winding tracts of the fistulous passages to their termination. Minute fragments of bone had been extracted through these passages; and as the purulent discharge from them was still free, it seemed certain that more dead bone yet remained; but since its situation could not be ascertained, no operation could with propriety be undertaken for its removal. No other resource appeared available than to leave the disease to the natural processes which it was hoped might yet be adequate to the removal of the dead bone.

Since, in many of the instances of necrosis attacking small portions of bone, it is not possible to make out satisfactorily the history of the disease in respect to the cause of the death of the bone, it is necessary to dwell on the common feature of all these cases, namely, the existence of one or more fistulous passages in the soft parts, often circuitous in their course, and the orifices of which in the integuments are often at a great distance from the piece of dead bone to which they lead.

A fistulous passage in the soft parts adjacent to dead bone, whether this be superficial or deep, is an almost unvarying occurrence. In superficial necrosis, abscess forms in the adjacent soft parts, and the matter tracks its way to the integuments through which it is discharged, the abscess then contracting to the fistulous passage which leads to the dead bone. And in deep necrosis, implicating only the inner lamellæ of a bone, a fistulous passage is formed, first in the adjacent walls of the bone, and then in the soft parts covering it. Only a single exception to this has occurred within my own observation, which was in an instance of necrosis affecting portions of the inner lamellæ of the femur, and of the tibia in the same individual. Here the perished inner lamellæ have completely separated from the living bone; yet there is

no fistulous passage in the walls either of the femur or of the tibia*. Under these circumstances, it is not to be expected that abscess and fistulous passages would form in the soft parts adjacent to the bone which is the seat of necrosis.

Symptoms of Necrosis. Necrosis of the outer lamellæ of a bone is not, in its early stage, readily distinguishable from other inflammatory affections of either periosteum or bone. The phenomena ordinarily attendant on its progress are—separation of the periosteum from the dead bone; inflammation of the periosteum, followed by suppuration beneath it, and by ulceration of it with the investing soft parts, affording outlet to the matter, and terminating in a fistulous passage leading to the dead bone.

Necrosis of the inner lamellæ of a bone has its characteristic signs. Ordinarily, its first symptom is pain deep in the bone; but, in some instances, febrile disorder is the first symptom, continuing many days and even weeks, and then subsiding with the commencement of pain in the bone. The death of the inner lamellæ of a bone is followed by suppuration in the adjacent cancellous texture, also by the formation of a narrow fistulous passage in its walls, through which the matter escapes from the interior. Whilst these changes are going on within the bone, inflammation arises in the soft parts covering it, accompanied by a soft circumscribed swelling of the integuments, from which, when punctured or allowed to burst, matter will be discharged. Through the abscess in the soft parts, the orifice of the fistulous passage in the walls of the bone may be detected; but it may be so small as not to be found, and then the real nature of the disease will not, for a time at least, be known. Mr. Hey states that, in one case, he was led to suspect the existence of an aperture in the walls of the bone, from observing that more matter issued from the outward wound than the surface of it ought to have furnished†, and I have had opportunities of confirming the truth of this observation.

An exception to the foregoing statement of the phenomena consequent on necrosis of the inner lamellæ of a bone, has been just referred to, in an instance where the death and separation of the inner lamellæ of the femur and of the tibia, in the same individual, did not give rise to a fistulous passage in the walls of either bone.

Necrosis of the shaft of a bone in its whole thickness, whether limit-

* Museum of St. Bartholomew's Hospital, First series, Sub-series A. Nos. 118, 119.

† Practical Observations in Surgery, on Caries of the Tibia.

ed to a portion of its length, or extending through the whole of it, presents the following features.

Febrile disorder, in some cases, precedes the death of the bone; but, in most instances, a sudden attack of pain deep in the limb is the first symptom of it, and this is quickly followed by excessive inflammation in the soft parts, with accompanying fever. The first of the changes immediately consequent on the death of the bone is, that the periosteum no longer retains any hold upon it, and when separated from the bone the periosteum becomes acutely inflamed; the inflammation thence extending through the other tissues of the limb to the integuments, where it presents either a phlegmonous or erysipelatous character. In the several structures of the limb, the inflammation will terminate either in serous effusion, simply enlarging it; or in the deposit of fibrin, consolidating its textures; or in suppuration beneath the periosteum, and in the intermuscular cellular tissue, giving rise to one large abscess, or to many small abscesses in different parts of the limb. Incisions are in general required for the discharge of the matter from these abscesses; and then, unless there is any unusual source of irritation maintaining the suppuration, the quantity of matter secreted will gradually diminish, and some of the passages through which it has been discharged will become closed, whilst others, remaining fistulous, will lead to the cavity in which the dead bone is enclosed. Whilst these changes are in progress, the bulk of the limb will be gradually lessened by the absorption of the serum or fibrin diffused through it; but its several tissues will remain so densely consolidated and compacted together, that if an incision be made into them, they will be found to consist of a firm brawn-like substance, in which the original structure and arrangement of the parts can scarcely be recognized.

Necrosis of the shaft of a bone, through the entire circumference and thickness of its walls, is usually accompanied by the death of its medullary tissue to a corresponding extent. There are, however, instances of necrosis, the consequence of some strictly local cause, acting only on the surface of the bone, in which the walls of the bone perish, whilst the medullary tissue preserves its vitality. Such were the circumstances of the following case:—nitric acid was applied to a phagedenic ulcer in the leg; its action extended to the periosteum of the tibia, occasioning inflammation of the periosteum over nearly the whole extent of the bone. The walls of the bone, in consequence, perished; and the limb was amputated. In the examination of it, not-

withstanding the death of the entire walls of the bone, the medullary tissue was found to have preserved its vitality*.

Necrosis of the shaft of a bone near its articular end is often followed by the extension of inflammation to the adjacent joint; thus, disease in the knee-joint has ensued from necrosis, in either the femur or the tibia near its articular end; and I have known instances of disease in the hip-joint, the consequence of necrosis in the trochanter major of the femur. In another way, destruction of a joint has ensued from necrosis in its neighbourhood; namely, by the abscess, which had formed in the soft parts around the dead bone, bursting into the joint. Destruction of the joint then quickly followed, with the severe constitutional disorder which always follows the bursting of abscesses into large joints. It is true, that disease in a joint, which has been the consequence of necrosis in its neighbourhood, is often with difficulty distinguishable from the acute affections of joints arising in other ways; yet attention should be alive to the occurrence of such cases. More than once I have been present at the examination of an amputated joint, when there was occasion for regret, that before the operation it had not been ascertained that a small piece of dead bone lay loose, but imprisoned within the living bone, near to the joint, whence it might have been easily removed; because, if this had been done, the disease in the joint might have been expected to subside.

When the bone attacked by necrosis is of small size, or only a small portion of it had perished, and in a patient who is not of an irritable habit, the inflammation which ensues in the surrounding soft parts is usually so mild that it gives rise to the effusion of fibrin or of serum, without suppuration, the disease then passing through its several stages unaccompanied by any other change than the simple enlargement and thickening of the parts adjacent to the dead bone. Under such circumstances, difficulty is often experienced in determining the nature of the disease, for it may then be doubtful whether the enlargement of the limb has been caused by necrosis, or by chronic inflammation of the bone, or by thickening of the periosteum, such as occurs in scrofulous children, in whom the periosteum of one bone, or of several, often becomes so much thickened as to produce an enlargement of the limb, simulating that which is caused by disease in the bone itself.

Necrosis of a portion of the cancellous texture within the articular end of a bone is a very formidable disease, as it is so often followed by

* Museum of St. Bartholomew's Hospital, First series, No. 19, Plate 7, fig. 2.

the destruction of the adjacent joint. The most frequent seat of this disease is the head of the tibia, to which the following account of it will particularly refer. It mostly occurs between the ages of fifteen and twenty years. Often it arises without appreciable cause; but, in some cases, it appears to have been the consequence of a blow upon the knee. Here the necrosis, although in general of small extent, is formidable, from its proximity to the knee-joint, which, in all the instances that I have seen, at an early or late period, became involved in the inflammatory processes set up in the parts adjacent to the dead bone. In some cases, the disease has rapidly run its course, by speedily causing destructive inflammation of the joint; whilst in others, its progress has been slower, extending through many years of almost constant suffering, accompanied by gradual disorganization of the joint.

The dead portion of the cancellous texture within the head of the tibia is rarely so large as a hazle nut; its situation varies, being nearer to the front or back wall of the bone, or to its upper articular surface, in one case than in another. The separation of the dead from the living bone usually takes place in an early stage of the disease. The piece of dead bone is then loose in a suppurating cavity, lined by a thick and very vascular membrane, from which pus is secreted more or less abundantly, according to the degree of excitement in the surrounding parts. The dead bone, being an irritant, excites constant pain, with successive attacks of inflammation, in the adjacent living bone; also in its periosteum and in the knee-joint. Consequently, the surrounding cancellous texture becomes hardened, and narrow ulcerated passages, which become fistulous, extend in various directions through the hardened bone to the front or back wall of the tibia, or towards its upper articular surface. If these ulcerated passages extend through the wall of the bone to its periosteum, matter will then accumulate beneath the periosteum, or ulceration of the periosteum will ensue, permitting the extension of the abscess into the surrounding soft parts. If one of the ulcerated passages in the bone should extend upwards to its articular surface, and then open into the knee-joint, rapidly destructive inflammation of it will ensue. During the progress of the disease, the periosteum investing the head of the tibia and the cellular tissue around it, become thickened and indurated, thus giving to the bone the appearance of actual enlargement. In illustration of the foregoing history, the following case is related.

Necrosis of the cancellous texture within the Head of the Tibia. In a female, sixteen years of age, without appreciable cause, attacks of

pain occurred in the upper part of the leg. Shortly after their commencement, an abscess burst in the front of the leg, a little below the knee; the opening became fistulous, and continued so through the next sixteen years, constantly discharging matter. A probe passed into this opening entered the head of the tibia. Incisions had been many times made down to the bone, and several small exfoliated portions of the cancellous texture of the head of the tibia had been taken away, with, however, but little benefit; more or less constant aching in the bone continued, with occasional paroxysms of severe pain, each of which was followed by a more profuse discharge of matter. Latterly, the attacks of inflammation had extended to the knee-joint. The increase of pain was attended with aggravated constitutional derangement, and the general health became so seriously affected that, at the age of thirty-two, when the disease had been sixteen years in progress, the removal of the limb was decided to be a necessary measure. On examining the amputated limb, I found a dead portion of the cancellous texture, about the size of a hazel nut, firmly impacted in the interior of the head of the tibia, half an inch below its upper articular surface. The dead bone was, therefore, so situated that its removal by operation could scarcely have been effected without penetrating the knee-joint. The several structures of the joint had undergone the usual changes consequent on long-continued inflammation; the synovial membrane was thick and pulpy, with lymph adhering to its free surface. The crucial ligaments were softened, and the articular cartilages were in part absorbed*.

Although necrosis of the cancellous texture, within the lower articular end of the tibia, is much less frequent than within the head of the bone, yet I have known it to occur, and to be followed by the destruction of the ancle-joint.

The history of necrosis through its further stages is now to be traced.

Mode of Separation of Dead from Living Bone. The separation of dead from living bone is termed exfoliation; and the separated piece of dead bone is termed sequestrum. The process of exfoliation is analogous to that by which any of the softer solids of the body, having lost their vitality, become separated from the living structures. The separation of a slough from soft parts, and the exfoliation of bone, pre-

* Museum of St. Bartholomew's Hospital, First series, No. 123, Plate II, fig. 3.

sent similar phenomena, with the differences only which result from the difference in their organization. This fact has been ascertained, as well by observation of the process of exfoliation in the human subject as by experiment in animals.

If, in a living animal, a bone is rubbed with caustc, or otherwise injured to the degree of causing necrosis of its surface, a red line in the contiguous living bone will speedily appear, just as increased vascularity shows itself in the skin immediately around an eschar. In either instance, an increased vascularity of the living tissue, contiguous to that which has perished, is the first stage in the process of separation. Along the red line in the living bone, a groove between it and the dead bone is then formed, which gradually deepens, until the separation of the dead bone is complete. Mr. Hunter observed that this groove is formed by the absorption of the living bone adjacent to the dead bone, and that the earthy matter of the living bone first disappears; consequently, that the bone is softened before the groove appears in it*. Whilst the dead bone is separating, by the gradual deepening of the groove between it and the living bone, the groove becomes filled by granulations growing from the exposed surface of the living bone. Hence, in the section of a bone, where exfoliation is in progress, a soft vascular tissue is found to occupy the line of separation; and in detaching a piece of dead bone, the subjacent surface of the living bone is found to be covered with a soft, velvet-like, layer of very vascular granulations; further, upon the exfoliated surface of dead bone, small circular hollows are seen, which exactly fitted to the granulations from the living bone.

The layer of granulations beneath an exfoliating bone sometimes causes it to emit a hollow sound when struck with a probe; this was noticed by the old writers, and commented upon by them as diagnostic of "the corrupted bone," as they called it.

The exfoliation of bone and the shedding of the antlers in deer are analogous processes. The antler becomes softened at its base previous to its separation, just as living bone becomes softened preparatory to the formation of the groove between it and the dead bone; and the separation of the antler exposes a very vascular and velvet-like surface, like the granulating surface of living bone exposed by the detachment of dead bone.

Mr. Hunter was the first to investigate the exfoliation of bone as a

* Experiments on the Growth of Bone and on Exfoliation. Hunter's Works, 8vo. Vol. iv. p. 315.

vital process. He observes, that "the notion entertained before his time was, that the dead bone rotted away;" but he adds, "the bone is only dead, not putrid." The results of Mr. Hunter's experiments on animals are shown in a series of preparations preserved in his museum, which display the process of exfoliation through all its stages. And as the great object, in the mind of Hunter, was the investigation of the actions of life in health and in disease, through all the forms of animated nature, it was not likely that the appearances observed upon the surface of a treo, from which a portion of the bark has been removed, would fail to attract his attention, from the resemblance they exhibit to the process of exfoliation of bone; accordingly, in his museum, this subject was commenced by preparations exhibiting the process in wood analogous to exfoliation in bone*. These preparations show, that the separation of a layer of wood, which has perished after the removal of the bark covering it, takes place in the same manner that a superficial exfoliation of bones ensues after the detachment of the periosteum.

In modern times, the process of exfoliation has been investigated by the microscope, and with the following results: "When a portion of dead or dying bone, is about to be separated from the living, the process which occurs," says Mr. Goodsir, "is essentially the same as that which has been described [in the account of the separation of a slough in soft parts]. The Haversian canals, which immediately bound the dead or dying bone, are enlarged contemporaneously with the filling of their cavities with a cellular growth. As this proceeds, contiguous canals are thrown into one another. At last, the dead or dying bone is connected to the living by the cellular mass alone. It is now loose, and has become so in consequence of the cellular layer, which surrounds it, presenting a free surface, and throwing off pus†." This statement is of especial interest, as a confirmation of the accuracy of Hunter's view of the subject, obtained without the advantages enjoyed by the modern microscopic observer. The remarks of Mr. Goodsir, that the dead bone, in the latter stage of its exfoliation, is connected with the living bone by a cellular mass alone, corresponds with the representation of Hunter, that the process of exfoliation commences with the absorption of the earthy matter in the living bone contiguous to the dead bone.

* Catalogue of the Hunterian Museum.

† Anatomical and Pathological Observations, by John and Harry Goodsir, Edinburgh, 1845.

The foregoing views derive additional interest from an examination of the chemical qualities of the pus discharged from the parts adjacent to exfoliating bone. About ten years ago, Mr. Thomas Taylor examined for me some pus taken from an ulcer around an exfoliating portion of the tibia, and he noticed the large quantity of phosphate of lime which this pus contained, but bestowed no further attention on the subject. More recently, Mr. Bransby Cooper has observed, and accurately recorded, the characters of the pus obtained from the neighbourhood of exfoliating bone. His statements on the subject are, "that the discharge arising from diseased bone contains a large quantity of the solid constituents of bone in solution, which, consequently, pass off in these fluids;" that "the discharge from a case of diseased bone was found to yield, after incineration, from 72 grains of pus—

Phosphate of lime . . . . 1·75 grs. or 2·43 per cent.
Carbonate of lime and soda 1·5 grs. or 2·08 per cent."

Thus, "in the pus from parts around diseased bone, phosphate of lime was found in amount nearly 2 1-2 per cent., whilst in pus elsewhere obtained, only traces of phosphate of lime were discovered*."

Mode of removal of Dead Bone. There are facts which, apparently, prove that, in some instances, dead bone disappears without any sensible exfoliation of it. The following appear to be examples of this process:—In a middle-aged man, a severe attack of inflammation occurred in the walls of the tibia. An abscess formed over the bone, on opening which, the bone was found to be denuded of its periosteum. The surface of the exposed bone became of a dark brown colour. A few days afterwards, I observed a point of florid granulation rising from the centre of the discoloured bone; and, by means of a probe, this granulation was ascertained to have arisen through a minute canal in the walls of the bone, extending to its medullary cavity. Each day there was an addition to this small mass of granulations, and a corresponding enlargement of the canal in the walls of the bone, which, in about a week, was sufficiently widened to admit the passage of my finger into the medullary cavity. Another man had necrosis of the shaft of the ulna. Abscesses burst over the dead bone, which, when exposed, became of a dark brown colour to a considerable extent. The general health, which had been much deranged, gradually improved; and, at the same time, granulations from the surrounding soft

* Lectures delivered at the Royal College of Surgeons, reported in the Medical Gazette, May, 1845.

parts, gradually extending over the dead bone, completely enclosed it. The parts then became soundly healed without any apparent exfoliation. In a case where a portion of the front of the tibia perished, and had become of a black colour, granulations from the surrounding soft parts were observed to extend gradually over the dead bone. Whilst this was in progress, I raised, upon the edge of a spatula, the free border of these granulations, and exposed little hollows in the surface of the dead bone, to which the granulations were exactly fitted*. In these several instances, the dead bone certainly disappeared, but not by any sensible exfoliation; the question will be respecting the mode of its disappearance.

In accordance with the doctrines of Hunter, it has been generally considered that, in such instances as those just adduced, the dead bone disappears by the agency of the absorbent vessels in the granulations adjacent to it; and, in confirmation of this view, the fact has been noticed, of the granulations being always in contact with the dead bone whilst this is in progress of removal; and, besides, that the granulations are so exactly moulded to the dead bone, as to indicate that they are the agents whereby the hollows in its surface are produced. Now, however, it being denied, upon grounds which are presently to be explained, that dead bone is ever absorbed into the system, we refer, with interest, to the account which has been rendered by Miescher, of a process of exfoliation, in which the dead bone is detached in particles so minute as not to be detected by the unaided sight, and which, therefore, has been designated, insensible exfoliation†. It is stated by Miescher, that the dead bone gradually disappears by the detachment of extremely minute and thin scales from its margin‡; that at the bottom of dry wounds, where there is exfoliating bone, such scales may be detected, but that, from their delicacy, the sharpest sight may not readily recognize them§. Such a view of insensible exfoliation cer-

* The following case, to the same effect as the instances above adduced, is recorded by Ruysch. A man fell from the horse on which he was riding; a portion of the scalp, over the frontal bone, was, in consequence, destroyed. The changes which ensued in the denuded bone are thus described: "Hæc ossis denudatio in totum nigricabat, circulo excepto, qui cuti proximus straminis latitudinem obsidebat. Hoc circulo albo de die in diem diminuto, patiens convaluit sine ulla visibili ossis separatione." Ruysch, Observat. Anatom. Chirurg., Obs. v.

† De Inflammatione ossium—Pars Pathologica: Prægressa exfoliatione in particulis, s. insensibili, p. 201.

‡ Margo tenuissimus lamellæ emortuæ tanquam corrosus apparebat, atque submissa lanceola, facillime in particulas minutas dilabebatur. Loc. cit.

§ Exfoliationem revera fieri, ita vero exiguas esse particulas accedentes, ut oculorum aciem prorsus fugiunt. Loc. cit.

tainly accords with the ascertained fact of there being a larger quantity of the earthly salts of bone in pus obtained from the neighbourhood of exfoliating bone. But it affords no explanation of the circular hollows to which the granulations are exactly fitted in the exfoliated surface of dead bone: it is, indeed, impossible to regard these hollows in the dead bone, as produced otherwise than by the agency of the granulations which are in contact with them.

An exfoliated piece of bone is always of less extent than the space in the living bone from which it was withdrawn. Hunter explained this by the absorption of the margin of the living bone during the exfoliating process; and, in the same view, he referred to the fact of the margin of an exfoliated bone being always beset with spicula, "whilst the surface of the edges of the remaining bone, so far from corresponding, is quite smooth*."

I have often, with interest, noticed a distinct pulsatile movement in the matter filling the cavity of a bone where exfoliation is going on; and I have supposed this movement to be derived from the arteries of the part pulsating against the fluid pus with more than their usual force. In relation to this curious occurrence, Mr. Hunter has thus expressed himself: "The pulsation of the matter, lying in a hole over the part where this process [exfoliation] is going on, I account for, by supposing that the impulse from all the subjacent granulations center in this hole containing the matter, as the motion of the mercury would be invisible in the bulb of the thermometer, but is evident in the thread of it†."

When the exfoliating process is completed, the dead bone is, in some instances, gradually extruded from the cavity in which it is lodged; and this appears to be effected by the pressure of the surrounding granulations against it. But the extrusion of the exfoliated bone may not ensue; either in consequence of its large size, or from its being enclosed within a tube of the newly-formed bone; and the next question for consideration will be, whether the exfoliated bone, remaining within its cavity, will undergo any change,—whether the adjacent living parts can act upon it and effect its removal.

It has been confidently held, that such a process does occur; but, in modern times, experiments and observations have been brought forward to show, that upon exfoliated bone the living parts can exert no

* Hunterian Reminiscences, by James Parkinson, 4to. p. 124.

† Hunterian Reminiscences, p. 124.

action; consequently, that it will remain unchanged, irritating, as a foreign body would do, the parts in its neighbourhood. It has been reported, that Sir William Blizard confined a layer of bone upon an ulcer in a man's leg, and that, when removed twenty-four hours afterwards, its weight was diminished, and its surface, which had been in contact with the granulations, was excavated. But this experiment has been often repeated in man and in animals with a different result. I have confined a layer of bone upon an issue, but never found its weight lessened, or its characters in any way changed. I have, also, confined pieces of bone in various situations within the bodies of animals, but never observed that they had undergone the slightest alteration. To the same effect are instances of comminuted fractures in man, where fragments of bone, which have been for many years enclosed within the living parts, are found unaltered, with the sharp edges and angles that are seen in recently fractured bones. Further, in a memoir on this subject by Mr. Gulliver, a series of well-contrived experiments are detailed, the results of which all tend to refute the doctrine of the removal of exfoliated bone by the agency of the living parts, and, in fact, wholly disprove the absorption of it.*

It often happens that dead bone, completely separated from the living bone, is yet firmly fixed by the close adhesion of the surrounding soft parts to its surface. Hence the difficulty experienced in getting away pieces of dead bone in cases of necrosis and of compound fracture. Such adhesion of the living parts to dead bone may perhaps be analogous to the natural connexion of the vascular with the extra-vascular parts of an animal body, namely, the hair, nail, cuticle. It has, indeed, been ascertained by Mr. Gulliver that, under certain circumstances, exfoliated dead bone may become again firmly adherent to living bone; thus, portions of dead bone introduced into the medullary cavity of the tibia in rabbits, and allowed to remain there for several weeks, acquired a firm adhesion to the adjacent living bone†; and specks of osseous substance deposited from the living bone were found upon the surface of the dead bone, and firmly adherent to it‡. Miescher, in his experiments on the process of exfoliation, observed the

* Experimental Enquiry on Necrosis, Medico-Chirurgical Transactions, Vol. xxi.

† The adhesion of dead to living bone is, of course, of the same character as the adhesion of a bullet to living bone. I opened the body of a man who was at the battle of Waterloo, and found a bullet projecting from the posterior surface of the sternum, but immovably fixed in its cancellous texture, which it had penetrated.

‡ Medico-Chirurgical Transactions, Vol. xxi.

granulations from the adjacent living bone penetrating the medullary canals of the dead bone*. In this way the firm adhesion of exfoliated bone to the living parts would be readily explained.

The exfoliation of bone is an uncertain process, in respect to the rapidity of its progress; nor can this always be explained by the circumstances of the age or health of the individual: for, in some instances, the process advances more actively in old than in young persons—in those of feeble health than in others of robust constitution. There are also instances of necrosis in which the separation of the dead bone never commences; and other instances in which the process having commenced, is, without appreciable cause, arrested in its progress. The following is an instance of the latter kind. Amputation of the thigh was performed thirty-five years after a fracture of the femur, which had been followed by abscesses in the soft parts, and the formation of a fistulous passage in the walls of the bone, which was still open at the time of the removal of the limb. A section of the femur discovered a small portion of its inner wall of a dark brown colour, and in part exfoliated†. Here, therefore, it appeared that a portion of the inner wall of the femur having perished, its exfoliation was but in part effected: it had retained its connexion with the living bone, and through the long period of thirty-five years, had been the source of suffering, which, at length, induced the patient to solicit the removal of the limb. That dead bone may thus retain its connexion with living bone for an indefinite period, is an important fact, as it bears upon the question hereafter to be considered,—under what circumstances operations for the removal of dead bone may with propriety be undertaken.

Reparative Processes consequent on Necrosis. Here we are to consider the various circumstances connected with the production of new bone to supply the place of that which has perished.

If only part of a bone has perished, its remaining portion and the surrounding soft parts become inflamed, and the changes which ensue in these parts constitute the first stage in the process of reproduction. Through its subsequent stages this process is diversely modified, according to the situation and extent of the dead bone, and by other circumstances hereafter to be stated.

* Loc. cit. p. 199.

† Museum of St. Bartholomew's Hospital, First series, No. 176. For the history of this case, and for the possession of the specimen, I am indebted to Mr. Pritchard, of Leamington.

Necrosis in the outer lamellæ of a bone, when accompanied by destruction of its coverings, including the periosteum, gives rise to the following changes—thickening and consolidation of the inner lamellæ of the bone, inflammation of the surrounding periosteum, occasioning osseous deposit beneath the membrane, and in its tissue; and in this way the dead bone becomes circumscribed by a thick projecting border of new osseous substance. In the instances which I have examined, the depression in the surface of a bone, consequent on the exfoliation of its outer lamellæ, was found filled with fibrous tissue. But in the experiments of Miescher, it appeared that reproduction of the exfoliated outer lamellæ was effected by ossification of the granulations filling the space between the dead and living bone*.

It was shown by Mr. Hunter, that necrosis of the outer lamellæ of a bone in animals is, under certain circumstances, followed by phenomena different from those which have been just described. The experiments of Hunter were made upon the metacarpal and metatarsal bones of the ass; and they appear to have consisted in the cauterization of the bone, with as little injury as possible to the soft parts covering it. Necrosis and exfoliation of the outer lamellæ ensued. Osseous substance gradually extended from the surrounding living bone over the dead bone, which thus became enclosed, except at one part, where it remained exposed, and where there was a fistulous passage in the soft parts leading to it. In the manuscripts left by Hunter, it is stated to have been his opinion, that the new osseous substance enclosing the sequestrum was formed by ossification of the granulations arising from the surrounding parts. His reflections on this curious process are thus expressed—"While nature is busied in getting rid of that part of the bone which is dead, she is laying on additional bone on the outside; the intention of which seems to be, that of keeping up the strength of the bone, which would, without this addition, be lessened by the loss of substance. This opinion is, I think, supported by this circumstance seldom occurring in this manner in any of the bones but those of the lower extremity, which support the animal. If this is true, it is a curious process by which nature endeavours to support the strength of these bones during a loss of substance, by throwing on the outside,

* Miescher observes, with respect to the granulations filling the space between the dead and living bone, "quarum id stratum quod ossi proximum est, ossificatur, exterius vero cum granulationibus quæ ex partibus mollibus natæ sunt confluit, et ad confingendam cicitricem cutis confert." Loc. cit. p. 236.

bone in proportion to the loss of substance within*." The preparations displaying the results of these experiments are contained in the Hunterian museum; they show the progressive enclosure of the exfoliating bone in the osseous cavity formed around it; they also show, that the granulations arising from the bottom of this cavity gradually extrude the dead bone from it; and that, by the ossification of these granulations, the cavity becomes obliterated. The peculiar results of Hunter's experiments appear to be owing to the circumstance, that, in them, the soft coverings of the bone were carefully preserved, especially the periosteum, which would take so large a share in the production of the new osseous substance enclosing the dead bone. On the other hand, in man, necrosis of the outer lamellæ of a bone is usually accompanied by destruction of the soft parts, and especially of the periosteum covering the dead bone.

If, in animals, the entire periosteum of the shaft of a bone is taken away, and lint wrapped around the bone, to prevent the reunion of its surrounding parts, the phenomena which ensue are, necrosis and exfoliation of the outer lamellæ, in the form of a complete cylinder, and the reproduction of the lost bone by ossification of the granulations arising from the exposed inner lamellæ†. And from this experiment it might be concluded that, in the human subject, certain specimens of necrosis, apparently consisting in the death of the entire shaft of the bone, and in the production of a new bone, chiefly by the periosteum, were actually instances of necrosis affecting only the outer lamellæ, and followed by the production of new bone from the exposed surface of the inner lamellæ. But it is doubtful whether, in the human subject, the reproductive power of the tissue of bone is adequate to the formation of so great an extent of new bone. In the human subject, the reproduction of the outer lamellæ of a bone can probably be but imperfectly, if at all, effected without the aid of the periosteum.

When necrosis extends through the walls of a bone to its medullary tissue, the reproduction of the lost bone will be effected chiefly by the medullary tissue, or by the periosteum, according to circumstances. The activity of the reproductive power possessed by medullary tissue, was manifested in the following instances. In a man whose arm was torn by machinery, above four inches of one side of the ulna were de-

* Works, 8vo. Vol. i. p. 526.

† Troja, de novorum ossium regeneratione experimenta, 1775. Meding, Diss. de regen. ossium, 1823.

tached by a longitudinal fracture. Granulations, arising from the exposed medullary tissue, filled the vacancy in the walls of the bone, and it appeared to be by the ossification of these granulations, that the reproduction of the lost bone was effected. In a dog, I removed part of the walls of the tibia, exposing its medullary tissue. Granulations soon arose from this tissue, filling the vacancy in the walls of the bone, and when the animal was killed, these granulations had become partly ossified*.

If, with necrosis of the walls of a bone, its periosteum as well as the medullary tissue is preserved, the production of new bone will chiefly ensue from the internal surface of the periosteum. This mode of reproduction was exemplified in the case already referred to, where inflammation of the periosteum of the tibia followed the application of nitric acid to a phagedenic ulcer in the leg, and on examining the amputated limb, it was found that the dead walls of the tibia had exfoliated from the cancellous and medullary tissue, and that the production of new bone was taking place from the internal surface of the periosteum†.

When necrosis attacks the inner lamellæ of a bone without extending to its medullary and cancellous tissue, the reparative process which, under favourable circumstances, may ensue, consist in the consolidation, by osseous deposit, of the medullary tissue, in the thickening and induration of the outer lamellæ, and in the deposit of osseous substance upon the surface of the bone, beneath the periosteum. When the separation of the inner lamellæ is completed, the dead bone will be contained in a cavity between the thickened outer lamellæ and the consolidated medullary tissue.

When the entire inner lamellæ of a bone have perished, the dead bone is separated in the form of a tube, of varying thickness in different instances. Around the exfoliating inner lamellæ the outer lamellæ become consolidated together, and increased in thickness, by new osseous substance deposited on the outside of the bone. Such consequences frequently ensued in former times, after amputation, from inflammation in the medullary membrane of the remaining portion of the bone. In the museum of the Royal College of Surgeons, there are many examples of this form of necrosis, most of them in the femur, and all exhibiting a tube of dead bone either withdrawn from the cylinder formed by the thickened outer lamellæ, or still enclosed within it. But

* Museum of St. Bartholomew's Hospital, First series, No. 12, Plate 8, fig. 3.

† Museum of St. Bartholomew's Hospital, First series, No. 19. Plate 7, fig. 2.

these specimens exhibit the results of the surgery of a former age; whilst, in the museum of St. Bartholomew's Hospital, which contains only modern specimens of disease, notwithstanding the richness of its collection of diseased bones, there is only a single example of necrosis of the entire lamellæ of a bone after amputation. This occurred in the humerus; and the amputation was performed on account of compound fracture.

We have in the next place to consider the reparative process, consequent on necrosis of the entire thickness and circumference of the shaft of a bone through a part or the whole of its length.

There are four distinct sources of reproduction, which may severally be concerned in the formation of the new bone: these are—1, the periosteum; 2. portions of the original bone detached from its surface and remaining connected with the periosteum; 3. the articular ends of the original bone; 4. the soft tissues around the periosteum, or around the bone, if the periosteum has been destroyed.

There are facts which have been generally considered to prove, that periosteum possesses the power of producing bone. Among these, the results of the following experiments hold a prominent place. In a dog, I removed half an inch of the radius, involving its entire thickness, together with the periosteum covering it. In another dog, at the same time, I removed an exactly similar portion of the radius, care being taken in this instance to leave the periosteum entire, by slitting the membrane and separating it from the piece of bone that was taken away. Ten weeks afterwards both animals were killed. In the instance where the periosteum had been preserved, the bone was perfectly reproduced; but in the other, where the portion of the periosteum had been taken away, the vacancy in the bone was filled only by a dense fibrous tissue. Other circumstances of interest were observed in the result of this experiment. In the instance where reproduction of the bone failed, a principle of compensation from another source was manifested, for here, the ulna became greatly increased in thickness opposite to the vacancy in the radius, and by this means sufficient firmness was restored to the limb for the support of the body of the animal*. Experiments similar to the foregoing, and with the same results, had previously been made by Mr. Syme, of Edinburgh, to whom, therefore, the merit of suggesting them belongs†.

* Museum of St. Bartholomew's Hospital, Third series, No. 86—88.

† On the Power of Periosteum to form New Bone. By James Syme, Esq., "Transactions of the Royal Society of Edinburgh," Vol. xiv. p. 1.

Of the capacity for ossification in periosteum, and in other fibrous structures, under various circumstances of disease, there are many evidences. To one of these I would refer; namely, an old ulcer situated upon the front of the leg, occasioning, by its irritation, abundant osseous deposits in the surrounding periosteum, and in the adjacent interosseous ligament, converting it into a thick plate of bone. It has, indeed, been urged, that the irregular ossification of periosteum in this and other such instances of disease, is a different phenomenon from the exertion of a reproductive power in forming a bone of a certain size, and of the definite figure and structure required for its functions. But, both in the human subject and in animals, I have certainly witnessed instances of production of the new bone, presenting, to the unaided sight, all the appearances of regeneration by the periosteum alone.

Such instances were similar to the following. In a case of necrosis of the shaft of the femur, where the opportunity occurred of examining the limb in an early stage of the reproductive process, "the bone, for the space of about four inches, was found denuded of its periosteum and rough to the touch. The sides of the cavity occupied by the bone were partially composed of a sheath of bony granulations, in some spots nearly a quarter of an inch thick, firmly adhering to the periosteum, which itself adhered to the mass of muscles, and evidently proceeding from it*." In a case of necrosis of the shaft of the tibia, where the limb was amputated five weeks from the commencement of the disease, "a dense case, or shell, enclosed the dead bone, which proved to be the periosteum, greatly thickened with osseous matter deposited in its substance. The new bone did not constitute a continuous shell, but was deposited in scales, between which the periosteum intervened, so as to isolate them from each other. The osseous substance lay on the inner surface of the periosteum, with merely a fine film of the membrane covering it, but with a considerable quantity of soft gelatinous substance, like coagulable lymph, effused over this, so as to line the interior of the case. At several parts, of irregular size and figure, the periosteum did not exist, and at these parts there was a corresponding deficiency in the new bone†."

In similar instances, obtained by experiments on animals, if necrosis of the shaft of a bone is produced, the new bone will be formed, and

* Principles of Military Surgery, by John Hennen, M.D., p. 127.

† Clinical Report, by James Syme, Esq., Edinburgh Medical and Surgical Journal, January, 1836.

by a process which has been generally considered to furnish satisfactory evidence of the regeneration of bone by periosteum. The Italian pathologist, Troja, was, I believe, the first to institute this experiment. I have many times repeated it in dogs, and have thus had the opportunity of observing the phenomena of the reproductive process, which are here enumerated in the order of their occurrence :—inflammation of the periosteum, deposit of purulent fluid between the periosteum and the bone, deposit of gelatinous substance upon the inner surface of the periosteum, hardening and ossification of this gelatinous substance, separation of the dead shaft of the bone from its articular ends, and, lastly, the production of osseous substance from the articular ends, which becoming united with the new bone formed upon the internal surface of the periosteum, the osseous cylinder is thereby completed, and its continuity with the articular ends of the original bone established. Accordingly, in the first stage of the reproductive process, the periosteum is found soft and pulpy, from inflammation of its tissue, and consolidated with the surrounding parts, so as to form with them a vascular bed enclosing the dead bone. Upon the inside of this vascular bed, the new bone is formed. The new bone is lined by a layer of soft and very vascular tissue, which becomes the medullary membrane, with which, under favourable circumstances, the new bone is provided*. Dr. Macdonald instituted similar experiments ; but, immediately after causing necrosis of the shaft of a bone, he mixed madder with the food of the animal : and on examining the parts three days afterwards, he found the periosteum thickened, with a deposit of gelatinous substance upon its inner surface, in which there were osseous particles tinged by the colouring matter of the madder†.

Such are the principal facts upon which the doctrine has rested that the regeneration of the shaft of a bone is effected chiefly by the periosteum. But a different view of this subject is taken by some modern pathologists. By them it is denied that periosteum possesses the power of forming new bone, except through the means of portions of the old bone separated with the periosteum, and serving as nuclei of ossification ; and it is accordingly affirmed, that in all these instances of the regeneration of bone, the periosteum, whether detached from the bone in an experiment, or in the process of disease, takes away with it par-

* The preparations displaying the results of these experiments are preserved in the museum of St. Bartholomew's Hospital, First series, Diseases of Bone, Plate 8, figs. 1, 2, 4.

† De Necrosi ac Callo, Disp. Med., Edinb. 1799.

ticles, or filaments, of the old bone, and that it is from these the regenerated bone derives its origin*. The appearances which certain specimens of necrosis present are appealed to in confirmation of these views. In such specimens, roughness and excavations are visible on the surface of the old bone, opposite to the portions of newly-formed bone. The explanation of these roughnesses and excavations used to be, that they are the result of absorption, by the agency of the granulations arising from the internal surface of the newly-formed bone. But the absorption of dead bone, under any circumstances, being wholly denied, it is now suggested that the roughnesses and excavations, on the surface of the old bone, are occasioned by the detachment of portions of it with the periosteum. It is not to be denied that, in some instances of necrosis, the production of the new bone may be from nuclei thus separated with the periosteum; but there are specimens of necrosis of the entire shaft of a bone, in which the production of the new bone certainly appears to have been effected by the periosteum, without the aid of any nuclei of ossification derived from the surface of the original bone. One such specimen, at least, is contained in the museum of St. Bartholomew's Hospital; it exhibits necrosis of the shaft of the tibia, with the formation of the new bone considerably advanced around it. On removing the dead bone from the vascular bed in which it lay, its outer surface was found to be so perfectly smooth, in a great part of its length, that it appeared impossible that any particles or filaments could have been detached from it with the periosteum†. No other conclusion, in respect to this specimen, appears to be warranted, than that the new bone was formed by the periosteum of the old bone, which now invests the new bone. If, however, it be true, that, under whatever circumstances periosteum is detached from bone, whether by experiment or by the process of disease, shreds or particles of the bone are removed with it, and that they may be so minute as not to be recognized by the unaided sight, then, even in such instances of necrosis as the one just described, it might be urged that

* The following are some of the authorities here alluded to:—Müller's Elements of Physiology. The observations which its able translator, Dr. Baly, has appended to the section on the Reproduction of Bone after Necrosis, Vol. i. p. 470. Dr. Knox's Observations and Cases illustrative of the Pathology and Treatment of Necrosis, Edinburgh Medical and Surgical Journal, Vol. xviii. Mr. Goodsir's Anatomical and Pathological Observations, Edinburgh, 1843.

† For this valuable specimen my acknowledgment is especially due to the liberality of Sir James M'Gregor. Museum of St. Bartholomew's Hospital, First series, No. 133, Plate 9, fig. 1.

the shreds, or particles, so detached from the original bone, may be the nuclei of ossification, and thus constitute the origin of the new bone. But it should be observed, that this view of the subject deprives the periosteum of none of its importance in the regenerating process; for if the periosteum be destroyed, the particles of bone connected with it must lose their vascular supply, and perish. And, accordingly, in all cases of necrosis, the same practical importance should be attached to the preservation of the periosteum, as if it were proved to be the sole and exclusive source of the regenerative power.

Two other sources of reproduction in necrosis of the shaft of a bone are yet to be noticed; namely, the articular ends of the bone, and the surrounding soft parts independently of the periosteum.

New osseous substance is produced from the articular ends of the original bone; but it does not appear that this is ever more than sufficient to effect their union with the newly-formed shaft of the bone.

It has been a question whether, if the periosteum, with its nuclei of ossification, be destroyed, the surrounding soft tissues will take on the reproductive power. That this may occur in the human subject and in animals is apparently proved by the following facts:—In compound fractures of the leg, where a portion of the tibia, in its whole circumference and thickness, with the periosteum covering it, has been taken away, yet the vacancy in the bone has become filled with new osseous substance, and the reparative processes have been completed without shortening of the limb. Here, the new bone was produced probably in part from the adjacent ends of the bone; but principally, from the surrounding soft tissues. In a dog, the medullary tissue of the tibia was completely destroyed; and, at the same time, the periosteum was separated from the entire shaft of the bone, and wholly taken away. Six weeks afterwards the animal was killed; and on examining the limb, a new bone was found to be in progress of formation around the dead shaft of the bone. A similar experiment was made by Mr. Russell, of Edinburgh, who states, "that in one experiment, the periosteum was scraped off the bone of the leg; yet, notwithstanding its removal, a new osseous mass was formed, with all the appearances which usually attend the renovation of bone, and in all the perfection of an ordinary case of necrosis*." Again, to the same effect, were the experiments of Dr. Macdonald. He removed portions of periosteum from the bones of birds, in which he had previously destroyed the medullary

* Essay on Necrosis, p. 26.

tissue, and found that the formation of new bone took place in the situations where the periosteum had been removed, though more slowly than in other situations where the periosteum remained.*.

It thus appears to be well established, that, under certain circumstances, the soft tissues surrounding the dead bone, independently of the periosteum, may take an active share in the production of the new bone. The circumstances favourable to this mode of regeneration are, that around the dead bone there should be a thick stratum of soft parts; and that the inflammation in them, consequent on the death of the bone, should have been so mild as to terminate in the effusion of serum, or fibrin, rather than in suppuration. By attention to these circumstances, we are enabled to explain the partial regeneration of the bone which ensues in certain instances of necrosis; the new bone being formed only in those situations where the periosteum of the original bone, and the surrounding soft structures, are uninjured; whilst, in other situations, where, by the violence of the inflammatory processes, these structures are destroyed, the reproduction fails. Thus, in necrosis of the tibia, the new bone is frequently formed only to the extent of the posterior half of the shaft; whilst, upon its anterior half, the inflammatory processes having destroyed the periosteum with the thin covering of soft parts on this side of the bone, no reproduction here ensues; and, consequently, the new bone, comprising only half the cylinder, forms a sort of trough, in which the old and dead bone is lodged. Certain instances of the imperfect reproduction of bones, removed by operation, admit of similar explanation. Thus, in the case where Mr. Travers removed the clavicle with its periosteum, on account of a tumour originating in it, the newly-formed bone is thus described:—"The production of bone, of a cylindrical figure, from the truncated extremity of the clavicle, extends at least two inches, and terminates beneath the centre of the cicatrix, in a firm ligamentous band adherent to the skin†." Here, therefore, the new bone was produced only from the portion of the clavicle which had been left in the operation; and, accordingly, in this case, it was seen to what extent the reparative process would ensue unaided by the periosteum, and deriving but little aid from the surrounding soft parts. The clavicle being covered only by skin in the half of its circumference, it is much less favourably circumstanced for the reproductive process, than a bone deep-

* Disp. Inaug.
† Medico-Chirurgical Transactions, Vol. xxi.

ly imbedded in soft tissues, which would readily form the vascular bed, or matrix, of the new bone.

Other circumstances, in the history of necrosis of the shaft of a bone, are yet to be mentioned.

In cases where the periosteum of the original bone is preserved, the new bone, being formed upon its internal surface, is invested by it; but in instances where the periosteum of the original bone is in great part destroyed, the new bone has for its immediate investment a thick layer of dense cellular tissue, which answers all the purposes of periosteum, transmitting the vessels to the bone, and giving attachment to the surrounding muscles, tendons, and fasciæ.

In the walls of the new bone there are holes, of various size and number, penetrating to its interior. In the experiments on animals, these holes in the new bone are found to correspond with vacancies in the periosteum, occasioned by the destruction of portions of it, during the inflammatory process immediately consequent on the death of the original bone. At a later period of the reparative process, the holes in the new bone become continuous with the fistulous passages in the soft parts extending to the surface of the limb; and, consequently, they are the ways of exit for the matter, which would otherwise accumulate around the dead bone. Through these channels, moreover, portions of the dead bone are spontaneously discharged, or may be removed by surgical interference. Whether any of the holes in the new bone ever become closed by osseous substance is uncertain. Most of them are certainly permanent, but they are productive of no inconvenience, as the soft parts heal soundly over them when the whole of the dead bone has disappeared.

The new bone may consist throughout of cancellous texture, or it may be as dense and hard as bone which has been the seat of chronic inflammation. Its outer surface is, in general, rough, and presents numerous depressions, into which processes of periosteum and the vessels enter. The interior of the new bone presents, in some instances, a medullary tissue, as perfect as in an originally-formed bone. That the new bone possesses the entire apparatus of nutrition, arteries, veins, absorbents, and nerves, cannot be doubted. The phenomena it presents prove it to be not less perfect in its vital than in its physical properties.

There is a period in the progress of the reparative processes, when the articular ends of the original bone are detached from it, but n

yet so firmly connected with the newly-formed bone as to resist the action of the surrounding muscles. Under such circumstances, the articular ends of the bone may become approximated, and, if allowed to remain so, the new bone will be deficient of its proper length. In some instances it has been so to the extent of several inches. More serious consequences have ensued from the spasmodic action of the muscles around the separated shaft of the bone forcing its pointed extremity into a contiguous joint, or into a large blood-vessel. Thus, in one instance, the pointed extremity of the femur was forced through the synovial membrane of the knee-joint, exciting such severe inflammation in it, that the removal of the limb became necessary for the preservation of life ; and, in another case, the pointed extremity of the femur was forced through the femoral artery, causing profuse hæmorrhage, on account of which the limb was amputated. Further, it has happened that a small detached piece of dead bone has penetrated a large artery contiguous to it. Of this occurrence the following instance is recorded: A young man, who had long suffered from necrosis of the lower part of the femur, with fistulous passages leading to the dead bone, experienced, whilst dancing, a sudden uneasiness in his thigh, and, on looking down, observed his trousers to be stained with blood, which was found to have issued from the fistulous orifices. The hæmorrhage was arrested, but it several times recurred. At length, on the occurrence of a free flow of arterial blood, the femoral artery was tied in the upper third of the thigh. The hæmorrhage did not recur, but gangrene appeared in the limb, and rapidly extended through it to the groin, from which the patient sunk. On examining the limb, a slit was found in the popliteal artery, and close to the slit lay a portion of bone which was jagged, thin, and sharp.*

There is so much uncertainty with respect to the time required for the reproduction of the shaft of a bone, that on this point no definite statement can be made. In most cases, necrosis of the shaft of a bone commences in early life, and the reproductive process is completed whilst the body is growing. In instances where the process of reproduction advances so slowly that it extends through several years, the growth of the limb is not interrupted, the new bone increasing in length and thickness proportionately to the rest of the limb.

The cases of necrosis most favourable for the reproductive process, are those in which the bone suddenly, and at once, completely per-

* Dublin Journal of Medical Science, Nov. 1835.

ishes, and in which, besides, there has been no interference with the consequent inflammation in the periosteum and surrounding parts, constituting the first stage of the reproductive process. When the bone has very slowly perished, or when its death has been preceded, or is accompanied by, morbid changes in its tissue, or in the surrounding soft parts, the reproductive process will probably fail. One of this class of cases of necrosis in the tibia, was under the care of Mr. Parker, in the Radcliffe Infirmary, Oxford. The patient was a female, seventeen years of age, and the disease had been two years in progress when the leg was amputated. The middle third of the shaft of the tibia had perished, and this was accompanied by widely-spreading ulcerations in the surrounding soft parts. The dead bone separated from the living bone, and it was removed by operation; but no new bone formed in its place. The limb became useless, the ancle and foot hanging like those of a paralytic-leg, or of a leg with an ununited fracture. Under these circumstances the limb was amputated, and, on examining it, there was found, in the space between the upper and lower portions of the tibia, only a thick cord of dense fibro-cellular tissue, of the same character as the tissue, which, in most un-united fractures, is found in the space between the ends of the bone*.

In these instances of necrosis, it is probably owing to the diseased condition of the soft parts around the dead bone that the new bone is not formed, The reproductive process, in consequence, advances only to the formation of a dense fibro-cellular tissue; it fails in the completing stage, which is the development by ossification of this tissue into bone.

Necrosis, followed by reproduction, in any of the flat bones, is rare; in some of them it never occurs; for example, in the flat bones of the cranium, as would be expected, from the consideration of the difference in the relations of the pericranium and dura mater to the cranial bones from those of periosteum to other bones, the pericranium having no tendency to form new bone, and the dura mater having this tendency in a very limited degree; here, moreover, there is no stratum of soft vascular tissue, to serve as the matrix of reproduction. There have been instances of reproduction of portions of the ilium and of the scapula.

Necrosis of the ilium is frequently observed; but it rarely occurs under circumstances favourable to the reproductive process; and for

* The amputated limb was presented by Mr. Parker to the museum of St. Bartholomew's Hospital, First series, No. 260.

other reasons it always constitutes a serious, and mostly an irreparable, disease. The exfoliation of the dead bone here advances very slowly, and frequently it is never completed. I have seen several of these cases, in which the dead bone had continued for many years, apparently unchanged, with the open fistulous passages leading to it. When the posterior part of the ilium has perished, occasioning the destruction of its articulation with the sacrum, a complication of disease is thus produced, the reparation of which is scarcely to be expected; for, without the exfoliation and reproduction of the bone that has perished, there can be no anchylosis of the ilio-sacral articulation, and, consequently, no restoration of firmness to the walls of the pelvis. Rather it is to be expected, that, as in the following case, the vital powers will sink from the irritation of the disease. A middle-aged man was admitted into St. Bartholomew's Hospital, on account of severe pain in the lower part of the back, which was consequent on the effort of lifting a heavy weight. Fluctuation becoming perceptible on the back part of the pelvis, an incision was here made, giving outlet to matter; and at the bottom of the abscess, the rough and denuded surface of the ilium was discovered by a probe. An issue was opened near the diseased parts, which relieved the pain: every effort was made to assist the reparation of the disease by strengthening the system, but to no purpose. After lying in the hospital several months, he died. On examination, I found necrosis of the posterior part of the ilium, with the destruction of its articulation to the sacrum, and there was no separation of the dead bone.

It is doubtful whether any of the short cylindrical, or irregularly-shaped, bones are ever reproduced.*

Instances of necrosis in early life have occurred, wherein a small portion of the dead bone, not separated from the living bone, has remained unchanged for many years, and the fistulous passages in the soft parts leading to it have become closed. Under these circumstances, the patient has presumed upon the sound condition of the parts; but, after the lapse of some time, it may be a year, or longer, a fresh attack of inflammation, followed by abscess and the re-opening of the fistulous passages, has shown that the original source of irritation still existed. But the complete cicatrization of the soft parts over dead bone, however small its extent, is a rare occurrence, and it

* Ossa brevia sive cuboidea, quantum ego quidem indagando assequi potui, nunquam regenerantur. Weidmann de Necrosi, p. 31.

probably occurs only in the instances where the separation of the dead from the living bone has failed to take place. When the dead bone is detached from the living bone, it becomes as a foreign body, an irritant to the adjacent parts; purulent fluid is in consequence formed around it, the outlet for which is the fistulous passages in the surrounding soft parts. So long, therefore, as this suppuration continues, the fistulous passages are sure to remain open. But, on the other hand, a small piece of dead bone, retaining its connexion with the living bone, may excite so little irritation in the surrounding parts, that no suppuration from them ensues, and, under such circumstances, it is not unlikely that the fistulous passages leading to the dead bone may become closed.

There are instances of necrosis in which portions of new bone, are found closely united to the exterior of the dead and exfoliated bone. And it may be doubtful how this happened; it may have been, that inflammation of the bone was followed by the deposit of osseous substance upon its surface, but that this new osseous substance was of unhealthy character, and that, in consequence, it perished with the original bone; or the new osseous substance may have been deposited from the surrounding tissues upon the dead bone, in the manner that this occurred in the experiments of Mr. Gulliver, already noticed, in which pieces of dead bone were introduced into the medullary tubes of the bones in rabbits; and, on examining the limbs some time afterwards, the dead bone was found to be adherent to the living bone by new osseous substance, having the composition of true bone*. An illustration of these phenomena occurred in a remarkable case of necrosis of the lower jaw, recorded by Mr. Perry. The entire jaw was removed by operation, and it was found enclosed in a new case, consisting of grey, porous, osseous substance, evidently of an unhealthy character. Nearly all the teeth remained in the mouth, and were kept together by their connexion with the gum. Mr. Perry and myself visited this patient six months after the removal of the lower jaw. We found her in good health, but there was no reproduction of the bone. I introduced my finger between her grinding teeth, and found that she could firmly bite it. She stated, that she chewed her food by a movement of the upper jaw, aided by the action of the tongue, in rubbing the morsel against the teeth†.

* Medico-Chirurgical Transactions, Vol. xxi.

† This remarkable specimen of necrosis of the lower jaw was presented by Mr. Perry to the museum of St. Bartholomew's Hospital, First series, No. 168. History of the case, Medico-Chirurgical Transactions, Vol. xxi.

The following are references to some of the least frequent examples of the reproduction of bone, consequent on necrosis :—

Lower jaw. In a girl, aged ten years, the whole ramus of the jaw, with its condyle and coronoid process, was extracted by Desault. Its place was supplied by regenerated bone, possessing the same solidity as the rest of the jaw, and its motions were equally perfect. "Chirurgical Journal," Vol. ii.

Separation of the ramus with the entire condyle. Recovery without alteration of the shape, or diminution of the mobility of the jaw. Clinical Report, by James Syme, Esq., in the "Edinb. Medical and Surgical Journal."

Scapula. Scapulam mortuam excidisse et regeneratam fuisse est vir clarus Chopart. "Weidmann de Necrosis," p. 28.

Clavicle. Necrosis of the clavicle in its whole extent, followed by the formation of a new bone, and the perfect recovery of the power of the arm. "Mem. de l'Acad. Royale de Chirurgie," Tome v.

Necrosis of the clavicle, consequent on a fall upon the shoulder. The dead bone was extracted through a fistulous opening; it comprised the sternal end, and nearly the whole length of the clavicle. The bone was completely reproduced. "Répertoire d'Anatomie et de Physiologie," Tome ii.

Sternum. Necrosis of a great part of the sternum. Reproduction of it was in progress. Museum of St. Bartholomew's Hospital, First series, No. 63.

Femur. Necrosis and exfoliation of the neck with the shaft of the femur in a child. The recovery was so perfect, that the limb became firm, and was but little shortened. Museum of St. Bartholomew's Hospital, First series, No. 204.

Fibula. Necrosis of the shaft of the fibula. Reproduction of it perfect. Museum of St. Bartholomew's Hospital, First series, No. 158.

TREATMENT OF NECROSIS.

In the treatment of superficial necrosis, two considerations arise; namely, can any thing be done to accelerate the exfoliation of the dead bone? and, should it be removed by operation?

In general, the best applications to the soft parts around dead bone are those of a soothing nature. There are, however, instances of su-

perficial necrosis, in which stimulant applications appear to be serviceable, by producing moderate excitement in the parts, which is favourable to the process of exfoliation, just as a slough in soft parts separates rapidly or otherwise, according to the degree of surrounding inflammation. For this object, mercurial ointment, mixed with soap cerate, is a suitable application. But the stimulant selected must not be powerful, since it might then have the effect of extending the necrosis, by exciting inflammation in the surrounding living bone. Another means of expediting exfoliation is to produce excitement in the parts around the dead bone, by exercise of the muscles of the limb in which the necrosis is situated. Thus, in a case of superficial necrosis of the tibia, I have often observed the exfoliating process to be stationary, whilst the limb was at rest; but that, when its muscles were put into constant action, activity in the exfoliating process was manifested. The constitutional influence of mercury has, in some cases, appeared to hasten exfoliation; and, accordingly, in instances of its unusually slow progress, mercurial ointment applied to the limb may be serviceable, as much by its constitutional influence as by its direct action on the parts around the dead bone.

In former times it was the practice to make applications to the dead bone itself, with the view of hastening its exfoliation. The actual cautery and the mineral acids were employed for this object. It has also been recommended that the dead bone should be softened by the application of a mineral acid to it, preparatory to its being scraped away. I have witnessed the application of nitric acid in this view; it rendered the bone porous, but did not appear to hasten its exfoliation. I have also witnessed the effect of the application of dilute muriatic acid to the surface of a tibia which had perished from syphilitic disease. The patient had been salivated, and the ulcer around the dead bone became healthy; but as its separation was not apparently advancing, lint soaked in dilute muriatic acid was applied to it, and frequently renewed, a thick layer of wax being placed around the dead bone to prevent the extension of the acid to the soft parts. As the surface of the bone became softened it was scraped away, and this was continued until the greater part of the thickness of the walls of the tibia was removed. But it was doubtful whether the proceeding had been advantageous, for several months afterwards there was still a thick border of dead bone circumscribing the excavation made by the acid.

It appears to have been the practice of M. Delpech to apply dilute sulphuric acid to dead bone, with the view of softening it and expedit-

ing its separation*. But, for this object, muriatic acid is preferable. If a piece of bone be immersed in dilute sulphuric acid, a crust of sulphate of lime will be formed on its surface, and its vascular and medullary canals will become filled with the same substance; in this way the further penetration of the bone by the acid liquor will be resisted, and the softening of it in consequence prevented. The application of potassa fusa, or of nitric acid, to dead bone is a safe proceeding; and, in some cases of superficial necrosis, it has appeared to accelerate the exfoliation of a thin layer of dead bone, by the excitement it occasioned in the contiguous living parts.

In instances of superficial necrosis occurring in bones which have a thin covering of soft parts, the removal of the dead bone by operation is expedient when, after a considerable time, the exfoliation does not appear to be advancing. The front of the tibia is best suited for such a proceeding, and it is here most frequently required. The extent to which the surface of a bone has perished is shown by the extent to which the soft parts have separated from it; but this will not indicate the depth of the necrosis. On this point there must be uncertainty, and, accordingly, I have known instances of an operation being undertaken, with the expectation that the necrosis comprised only a thin layer of the bone, when it was found that the entire thickness of its walls had perished.

In internal and deeply-situated necrosis, when a probe, passed through the fistulous passage in the walls of the bone, discovers the dead bone to be loose, the removal of it by operation is expedient; and it may be so even when the dead bone is not completely separated, on the ground of the tediousness of its exfoliation. But, under such circumstances, there will be difficulty in distinguishing the dead from the living bone at the bottom of a deep cavity, constantly filling with blood, and, consequently, the whole of the dead bone may not be removed. But the excitement of the operation in the surrounding parts will have the effect of expediting the exfoliation of the remaining portion of the dead bone.

If the fistulous passage in the walls of a bone leading to the perished portion of its inner lamellæ, or cancellous texture, is of sufficient extent, the dead bone may be extracted through it; but the enlargement of this passage is usually requisite, and it is difficult to do this

* Journal de la Société de Médécine de Bourdeaux. Souvenirs de la Clinique de Delpech.

when, from the long-continued irritation of an internal sequestrum, the walls of the bone have become thickened and indurated. Then, moreover, the periosteum, with the surrounding cellular tissue, being also thickened, its separation from the bone, preparatory to the perforation of its walls, will not easily be effected.

With respect to the operative proceedings in these cases, it is only necessary to observe further, that in superficial necrosis, the first object will be the division and separation of the soft parts to a sufficient extent to allow the removal of the dead bone; and that, in internal necrosis, the hole already existing in the walls of the bone should be the centre of the incision through the soft parts, the requisite portion of its walls being then removed by a trephine, or other suitable instrument. In internal necrosis, no more of the bone should be taken away than is necessary to allow the removal of the sequestrum from its interior, as the vacant space in its walls will become filled by only fibro-cellular tissue. Under such circumstances, if the tibia is the bone upon which the operation has been performed, its strength might not afterwards be sufficient for the support of the body. A single aperture, of no great size, in the walls of a bone may be sufficient for the extraction of a large sequestrum, provided it be conveniently situated for the passage of cutting forceps, by which the dead bone may be divided into two or more pieces. Dieffenbach suggests, that the sequestrum be broken by Heurteloup's stone-crushing forceps*; and I saw Dupuytren, in the Hôtel Dieu, apply Civiale's branched stone-perforator to a sequestrum in the femur; with the branches of the instrument he fixed the dead bone whilst he drilled it with the perforator. It is well to know, that the various instruments for perforating and crushing stones in the bladder have been employed to facilitate the extraction of sequestra, as a case may occur in which some of these instruments might be found useful. It is however certain, that the cutting forceps, of various sizes and shapes, are generally well suited to effect the division of the dead bone, for the purpose of facilitating its extraction.

In the treatment of necrosis of the shaft of a bone, in its first stage, the object is, to diminish the severity, and check the progress, of the inflammation in the surrounding soft parts. It is desirable that the inflammatory action should terminate in the effusion of serum, or of fibrin, rather than in suppuration; it is also desirable that the inflam-

* Operative Chirurgie, Cap. i. sec. iv.

mation should be confined to the neighbourhood of the dead bone, and especially, that it should not extend to any of the contiguous joints. In instances of necrosis of the shaft of the femur, from the neglect of sufficiently active treatment at the commencement of the disease, I have witnessed the extension of inflammation to the knee-joint, followed by suppuration in it, with the destruction of its soft tissues, and its permanent anchylosis. A strict antiphlogistic treatment is to be continued, until the local inflammation and the accompanying fever are arrested. Perfect quietude of the limb should be observed. It may be necessary to abstract blood from the parts, freely and repeatedly, by leeches; and, owing to the severity of the accompanying fever, general depletion may be requisite. Poultices and fomentations are the best applications to the limb, and saline and antimonial medicines the suitable constitutional remedies.

If, by the foregoing treatment, the inflammation in the parts around the dead bone does not quickly subside, suppuration is to be suspected, and may be indicated by shiverings. In some cases, suppuration commences beneath the periosteum; the matter thence penetrating the several textures of the limb to the skin. In other cases, suppuration commences in the cellular tissue between the muscles. Wherever the matter is situated it should be freely discharged, by one or more incisions; and care must afterwards be taken that the openings are sufficiently free, and conveniently situated, for the escape of the matter, that it may not accumulate in any part of the limb.

Upon the subsidence of the inflammatory processes, the thickening and consolidation of the tissues of the limb will be maintained by the irritation of the dead bone. If there should be constant pain deep in the limb, with occasional attacks of inflammation in the surrounding parts, counter-irritation, by an issue, is then indicated; and it may require to be continued so long as the source of irritation, namely, the dead bone, remains. The counter-irritant will relieve the pain; and, by bringing the parts into a quiet state, it will permit the free exercise of the limb, and thus relieve the patient from a tedious confinement, to the injury of his health. Moderate exercise of the limb is certainly favourable to the activity of the reparative processes, which will advance more rapidly to their completion than when the limb has been kept throughout in a state of inaction.

Through the early stages of necrosis of the shaft of a bone, attention is requisite to the position and length of the limb. The dead bone is often detached from its articular ends before the new bone has ac-

quired firmness. The support of splints is then required, to prevent shortening of the limb by the action of its muscles.

The next question is, under what circumstances, in necrosis of the shaft of a bone, is it expedient to undertake the removal of the dead bone by operation.

At the period when the shaft of the bone is separated from its articular extremities, the formation of the new bone is, in general, so far advanced that it forms an osseous case, enclosing the dead bone. Formerly, the absorption of the dead bone was relied upon as the means of its removal. But the observations upon this subject, in modern times, have rendered the doctrine of the absorption of exfoliated bone no longer tenable; and, consequently, the consideration of its removal by operation has become more important.

The perforation of the walls of the newly-formed bone is obviously requisite for the removal of the dead bone enclosed within it; and it has been suggested, that this should be done at an early period, when the new bone has not yet acquired the hardness of texture which, at a later period, will render the perforation of it difficult. But the removal of the dead bone, at this period, is open to the objection that the operation will probably be unsatisfactory, for, as the line of separation of the dead bone is not yet completed, its exact limits will not be distinguishable at the bottom of the deep cavity in which the dead bone is lodged; and, under these circumstances, there will be a risk, either of leaving some of the dead bone, or of removing part of the living bone with it.

The preliminary step to the operation of removing the dead bone is to ascertain that its separation is completed, and this may be evident by its looseness and mobility. But the exfoliated bone may still be firmly fixed by the surrounding granulations becoming closely imbedded in the excavations of its surface. On this point, Dupuytren offered the following suggestion,—that, with the end of one probe resting against the dead bone, a second probe should be introduced into another of the fistulous passages, and its end pressed against the dead bone: if this be movable, it will be made evident by the impressions communicated through the probe which was first introduced.

No rule can be laid down, either for the extent, or direction, of the incisions required for the extraction of the dead portion of the shaft of a bone. Usually the incisions are made in the interspaces of the fistulous passages leading to the dead bone; and in situations where incis-

ions of the soft parts cannot be safely made, dilatation of the fistulous passages, by sponge-tents, may render the incisions unnecessary; or, at all events, be the means of diminishing their extent. At the period when the operation for the removal of the dead bone is generally performed, the soft parts investing the new bone, are consolidated together, very dense, and, besides, acutely sensible, very vascular, and firmly united to the bone: hence, the incisions through these parts, and the separation of them from the bone, must be expected to be a difficult task, and very painful, and to be followed by profuse hæmorrhage from the divided vessels.

Attention should be directed, in these operations, to the point of removing as little as possible of the walls of the new bone, as there will be no reproduction of it; and if, in the instance of the femur or the tibia being the seat of necrosis, much of the newly-formed bone were removed in the operation of exposing and extracting the dead bone, the limb might thereby lose so much of its strength as not firmly to support the weight of the body.

Necrosis of a portion of the cancellous texture within the head of the tibia, is a case in which the question of removing the dead bone, by operation, is likely to arise. Through the several years which this disease usually occupies, there is rarely, for any length of time, a complete exemption from pain; attacks of inflammation, many times recurring in the periosteum covering the head of the tibia, and in the knee-joint, and abscesses bursting around the head of the tibia, with purulent discharge from the fistulous passages leading to the interior of the bone, altogether clearly enough indicate the source of the mischief to be a perished portion of the cancellous texture within the head of the tibia; and, at the same time, suggest the extraction of the dead bone by operation, as the proper, and, indeed, the only means of relief. It is most desirable that this should be done in the early stage of the disease, before destructive inflammation attacks the knee-joint, and before any of the fistulous passages, either within the bone or in the adjacent soft parts, have formed a communication with the joint. If, however, the case is decided to be a fit one for the perforation of the head of the tibia, difficulties are to be anticipated in the extraction of the dead bone, and from the following causes:—

In some instances the piece of dead bone, within the head of the tibia, is situated so near the upper articular surface that its removal would not be practicable without opening the joint. It is, moreover, often impossible to determine with certainty the precise situation of the

dead bone, so that the perforation of the head of the tibia shall directly lead to it. The fistulous passages are not always a direct guide to the dead bone; occasionally they extend circuitously through the head of the tibia, either in a vertical or horizontal direction; and often they open upon either the front, or side, of the tibia, at a considerable distance from the spot where the dead bone is situated. When the knee-joint has become extensively diseased, and the health of the patient is enfeebled by long suffering, then, in considering the difficulties likely to arise in extracting the dead bone, amputation of the limb may, under such circumstances, be deemed preferable to the hazardous and uncertain measure of the perforation of the head of the tibia; it was so deemed in two cases of this kind which I had in St. Bartholomew's Hospital.

Among the long bones, operations, for the extraction of perished portions of the shaft of the bone, are, in general, performed with the least difficulty upon the tibia, because here the operation is usually undertaken when the front part of the new walls of the bone are, as yet, so incompletely formed, that only some narrow, bridge-like, portions of the new bone will require to be divided, and in part removed, to allow the extraction of the dead bone.

In the humerus, operations for the removal of dead and exfoliated portions of its shaft are occasionally required. The cylinder of the new bone may be completely formed: but, provided that the dead bone within it is loose, its extraction can, in general, without much difficulty, be effected. The proceeding here necessary will probably be to enlarge one of the holes in the walls of the new bone, and then to facilitate the extraction of the dead bone by dividing it with the cutting forceps into two or more pieces, and the passage to the dead bone should be formed in the front and outer part of the arm, where there will be no interference with the principal vessels and nerves. In the instances of necrosis of the humerus requiring these operations, generally the bone has perished from some constitutional influence, independently of any local injury, or disease, and in young persons; consequently, the soft parts of the limb are healthy, and the reparative processes following the operation usually proceed so vigorously, that however large the incisions, for the removal of the dead bone, may have been, and however much of the new bone it may have been necessary to take away, for the purpose of getting at and extracting the dead bone, yet the recovery of the limb will be rapid and com-

plete, the arm becoming, in every respect, sound and efficient for all its offices.

There are no cases of necrosis more difficult to deal with, in respect to the question of operation for the removal of the dead bone, than those of its occurrence in the lower part of the femur, just above the condyles. Here the necrosis is usually consequent on local injury by violence. Great enlargement of the limb ensues in the seat of the necrosis, produced, in part, by thickening and consolidation of the soft tissues immediately around the bone; and in part, by changes in the bone itself, consisting in either the thickening of its walls, or the formation of new bone to supply the place of that which has perished. Frequently the inflammatory processes around the diseased bone extend to the knee-joint, giving rise to its partial anchylosis, by either the adhesion of its synovial surfaces, or the rigidity of the tissues around it. Moreover, the fistulous passages in the soft parts are often so situated, that, in taking them as the guide for the incisions to the dead bone, the femoral vessels will be endangered, and, not improbably, the knee-joint opened. Such are the considerations which, in several of these cases that I have seen, led to the conclusion that, in preference to undertaking a protracted operation for the removal of the dead bone, with the uncertainty of effecting it, and with the risk of doing serious mischief in the attempt, it is better to amputate the limb.

The treatment of necrosis in the bone of a finger or toe, in former times, was to amputate the part; but modern experience has suggested a better mode of proceeding in these cases. In necrosis of the first or second phalanx of a finger, the proper proceeding is, to divide the soft parts covering the dead bone sufficiently to permit its extraction. The bone will not be reproduced, and, consequently, as happens from scrofulous disease in one of the phalanges, the finger will become shortened, but it will still be useful. So likewise, in necrosis of the last or ungual phalanx; instead of amputating the end of the finger, or toe, a division of the soft parts should be made to allow the extraction of the dead bone. The finger will become a little shortened, but the nail will remain, and the bulbous form of the end of the finger be preserved, whereby it will be far more useful than it would be after the amputation of the last phalanx. A small fistulous orifice in the end of the finger or toe is the indication that a part, or the whole, of the ungual

phalanx has perished. By means of a thin probe the dead bone may be detected, but not in every instance; still, however, the long persistence of a fistulous passage in the end of a finger or toe, is to be regarded as sure evidence of the existence of either dead or diseased bone. Without clear evidence of the diseased bone having perished and exfoliated, it would be preferable to amputate the phalanx, as was done in the following case, communicated to me by my friend, Mr. Ormerod, surgeon to the Radcliffe Infirmary, Oxford. The end of the finger was pierced by a needle, which it was thought had probably pricked the bone. An ulcer formed on the finger, which could not be made to heal. When it had lasted a year and a half, the phalanx was amputated; and on examining the bone, a fistulous canal was found extending through it, but there was no dead bone. The disease here had evidently been abscess within the ungual phalanx, consequent on injury.

The following are illustrations of the operative proceedings required for the removal of dead bone.

Necrosis of part of the inner wall of the Tibia, consequent on Fever. A man, twenty-seven years of age, had disease in his leg, which commenced two years previously in Ceylon. He there suffered an attack of fever, and, about six weeks after the recovery from it, a small swelling formed on the front of the tibia, about one-third from the ancle; it burst in two places, and the two openings had remained, constantly discharging fœtid matter, to the present time. A probe introduced into each opening readily penetrated a channel in the front walls of the tibia, and at a considerable depth, passed over rough, but not loose, bone. I made a longitudinal incision, about four inches in extent, along the front of the tibia, and crossed it with a transverse incision; and then separated the thickened and indurated soft parts from the bone, to which they were firmly adherent. The surface of the bone was rough, and it bled so freely as to show great increase of its vascularity; further, two channels were observed in the walls of the bone corresponding with the two fistulous openings in the investing soft parts. With a trephine I removed part of the front walls of the tibia, and enlarged the opening with a small saw. The interior of the tibia being thus exposed, it appeared to be filled with tough and very vascular granulations; but on removing some of these, a surface of dead bone was recognized, consisting of the inner lamellæ of the posterior walls of the tibia. The dead bone was removed. The pain of the operation was very great, but it was followed by scarcely any con-

stitutional disturbance. In a few days, healthy granulations arose from the whole of the exposed surface of the bone, except at one spot, where it was discovered that a portion of the perished inner lamellæ of its posterior walls still remained. For its removal, it was necessary to take away another small portion of the front walls of the tibia. Afterwards, the whole cavity of the bone became filled with healthy granulations; and in about two months from the operation, the wound had completely healed.

Necrosis of part of the inner wall of the Tibia, consequent on Fever. A man was admitted into St. Bartholomew's Hospital on account of disease in his leg, which had commenced three years previously in the West Indies, immediately after an attack of fever. His suffering had been severe, and almost constant. A fistulous orifice in the soft parts led to a narrow channel, extending through the front walls of the tibia to its medullary tube within which a loose piece of dead bone was discovered. The channel in the walls of the tibia was so narrow, that, in order to get at the dead bone, its enlargement was necessary; and this was not easily effected, on account of the thickened and hardened state of the bone, which rendered the perforation of it extremely difficult. But, when the perforation was accomplished, the dead bone was easily removed, and it appeared to be part of the inner wall of the tibia. The cavity in the bone became filled with healthy granulations, and in a short time the leg was perfectly sound.

Necrosis of part of the inner wall of the Tibia, consequent on Injury. This case was similar to the foregoing, except that the death of the inner wall, and cancellous texture of the tibia, was consequent on the penetration of the bone by a steel arrow, in the East Indies. Here, also, much difficulty was experienced in perforating the thickened and indurated front walls of the tibia, to effect the removal of the dead bone from its interior.

Necrosis of part of the cancellous texture of the Tibia, in a young person. In the case of a boy, who had been several months in St. Bartholomew's Hospital, with a small ulcerated hole in the front of the leg, freely discharging matter, it was at length suspected the bone might be unsound; but it was not until the parts had been repeatedly examined with a probe, that a minute channel was discovered in the front walls of the tibia, extending to its medullary cavity. This was considered to be sufficient ground for believing that part of the cancellous texture, and, probably, of the inner wall of the tibia, had perished. Accordingly, I perforated the front of the tibia, and found a por-

tion of its cancellous texture dead and separated. The dead bone was easily removed, and the wounded parts healed so quickly, that, in a few weeks after the operation, the boy left the hospital with a sound leg.

Necrosis of part of the shaft of the Femur, consequent on Injury. A man was shot in the lower part of the thigh with an iron bullet; since which he had, for several years, suffered constant and severe pain in the soft parts around the femur, accompanied by the bursting of numerous abscesses; some of which had contracted to fistulous passages leading to the bone. His health was much injured from long suffering, and he solicited the removal of the limb. As, however, he referred to one spot at the lower part, and outer side, of the thigh, as the principal seat of pain, Mr. Earle here made an incision through the skin and muscles. Fortunately, this incision was made directly over a loose portion of the shaft of the femur, which appeared to have been splintered by the bullet. The piece of dead bone, about two inches long and one inch broad, was removed. All pain in the thigh afterwards ceased, the fistulous openings closed, and the healing of the wound was followed by soundness of the limb.

Necrosis of part of the outer wall of the Tibia. In the following case of superficial necrosis of the tibia, the dead bone was removed by operation before it had separated from the living bone.

A middle-aged man was admitted into St. Bartholomew's Hospital, with the front surface of the tibia in its whole width, and in two inches of its length exposed, and perfectly black. He had received a severe blow on the shin, which was followed by destruction of the soft parts and the death of the surface of the bone. When he had been in the hospital about three months, I examined, with a probe, the circumference of the dead bone, but could discover no groove between it and the living bone. As the separation of the dead bone thus appeared not to have commenced, the removal of it by operation, was considered to be a proper measure. Accordingly, with a trephine and chisels, I removed the whole of the dead bone, which comprised only the outer lamellæ of the front walls of the tibia, and did not extend to its medullary cavity. The exposed surface of the living bone bled freely, and was very acutely sensible. From this surface of the bone, granulations quickly sprouted forth, and the wound in a short time was soundly healed.

Necrosis of the entire shaft of the Tibia. In St. Bartholomew's Hospital, under the care of Mr. Lawrence. The necrosis in the whole

shaft of the tibia had commenced a year previously. The limb was greatly enlarged by the formation of the new bone. At the upper part of the leg, the dead bone was exposed, no new bone being here formed over it. At the lower part of the leg, a fistulous passage extended through the new bone to the dead bone enclosed within it. The space between this passage and the exposed portion of the dead bone was occupied by a bridge of new bone, about an inch and a half in width. When the exposed dead bone, at the upper part of the leg, was pressed, it yielded, thereby indicating that its separation from the articular end was here completed. With a probe passed through the fistulous passage in the new bone, the same yielding of the dead bone, at the lower part of the leg, was observed. The entire shaft of the tibia, thus separated from its articular ends, was a source of constant pain, and of profuse suppuration from the surrounding parts, seriously injuring the general health. Under these circumstances, the removal of the dead bone by operation was undertaken.

An incision being made down the middle of the front of the leg and through the greater part of its length, the skin and subjacent soft parts were freely separated on each side from the new shaft of the bone; then, with the saw and cutting-forceps, the bridge of new bone, which has been described, was divided in two places, so as to permit its removal. The whole of the dead bone was thus exposed, and, by using a little force, it was withdrawn, exposing the layer of very vascular granulations forming the lining of the new bone, and the surface of these granulations was remarkably smooth and soft. The dead bone comprised the whole thickness and nearly the whole length of the shaft of the tibia. The cavity from which the dead bone was withdrawn soon became filled with granulations, and the formation of the new bone proceeded to its completion, giving to the leg firmness, together with its natural size and shape.

Necrosis of the inner wall and cancellous texture of the Tibia. This resembles, in some points, a case which has been already related; but it contains other particulars of interest.

Several years before the admission of the man into St. Bartholomew's Hospital, the tibia had been penetrated, as in the case already related, by a steel arrow in the East Indies, since which his leg had been scarcely ever free from pain. The shaft of the tibia had become greatly enlarged, and several fistulous passages had formed in its front walls, through which many small pieces of bone had been discharged. A crucial incision over the front of the leg, and of considerable extent,

enabled me to turn aside four triangular flaps of skin with the subjacent soft parts sufficiently for the free exposure of the bone. Then, with a trephine, I removed part of the front walls of the tibia, which was very difficultly done, on account of the extreme thickness and hardness of the bone: its tissue was besides so acutely sensible, that the perforation of it gave the severest pain. Several small pieces of dead bone were removed from the medullary cavity of the tibia. Notwithstanding the severe pain and tediousness of the operation, but little inflammation ensued in the surrounding parts, and scarcely any constitutional disturbance followed it. Granulations quickly arose from the whole of the exposed surface of the bone, and they were so exquisitely sensible, that they evidently partook of the morbid sensibility of the thickened and hardened bone. Subsequently, the reparative processes were interrupted by two attacks of erysipelas in the leg, accompanied by inflammation of the absorbents of the thigh and much constitutional derangement. After the last of these attacks, the man directed my attention to a yielding of the leg in the situation of the disease. This yielding of the bone could not be explained by referring to the extent of the walls of the tibia that had been removed: rather, it appeared to be owing to a softening of the tissue of the inflamed bone*. Notwithstanding the softening of the bone, the wound healed soundly. Then, with the view of strengthening the limb, I desired the man to move about on crutches, with the weak leg slung in a bandage passed around his neck. In this way he improved but little; at the end of three months he could still bear no weight on the leg without its yielding. Next, with the view of exciting more action in the muscles of the leg, I removed all the bandages from it, and desired the man to sit on a table, for a certain time every day, with his legs dependent, and then, by the movements of his ancle-joint, to keep the muscles of the weak leg in constant action. The good effect of this proceeding was soon evident. With the consciousness of increasing strength in the limb, he became able to bear the weight of his body on it; and, on leaving the hospital, could walk with the support of a piece of paste-board confined to the side of the leg; and in this condition his leg re-

* This will perhaps be considered to receive some illustration from the fact, that in the treatment of an ununited fracture of the femur by seton, the new osseous substance has become softened after the occurrence of attacks of inflammation in the thigh. "Case where a seton was introduced between the fractured extremities of a femur, which had not united in the usual manner; by James Wardrop." Medico-Chirurgical Transactions, Vol. v.

mained for many years, during which I had several opportunities of seeing him.

Extensive Necrosis of the inner wall of the Tibia. In the following case of necrosis of the inner lamellæ of the tibia, the result of the operation undertaken for the removal of the dead bone, was not satisfactory; but its history will constitute a good record of the circumstances which may belong to such a form of disease. I admitted into St. Bartholomew's Hospital a female, twenty-two years of age, of remarkably feeble habit, evidenced by the weakness of her pulse, icy coldness of her hands and feet, blueness of the face and general emaciation, and by the fact, that with the best of diet and medicine but little could be effected for the improvement of her health. The disease, on account of which she was admitted into the hospital, was a chronic abscess in the upper and outer part of the thigh, unconnected with either bone or joint. Upon the subsidence of this abscess, she directed my attention to two soft and not painful swellings upon the front of her tibia, from each of which about two drachms of matter were discharged by puncture. The matter continued to flow so freely from the punctures, that I suspected it came from the interior of the tibia, and, accordingly, I examined the bone with a thin probe, which, at the bottom of each abscess, penetrated a minute canal, extending very obliquely through its walls to the medullary cavity. Thus it was ascertained, that the abscesses upon the front of the tibia were the outlets of matter formed within the bone. Through the following several months there was constant and severe pain in the bone, with repeated attacks of inflammation in the soft parts covering it, for the relief of which all the treatment by leeches, poultices, and lotions, with iodide of potassium and sarsaparilla, was but palliative, and only for a short time. Then, in the belief that the source of irritation must be the confinement of dead bone within the tibia, I made two perforations with a small trephine through the walls of the bone, in the situation of the two ulcerated passages in them. Through the spaces formed by the trephine, I removed several small pieces of exfoliated bone, and I hoped that these constituted the whole of the dead bone; but it proved otherwise. The pain in the tibia, and the attacks of inflammation in the soft parts covering it, recurred as severely as before the operation. In this condition she left the hospital, more than a year after her admission, and shortly afterwards she died, as I believe, from inflammatory disease in her chest. The diseased tibia is preserved in the museum of St. Bar-

tholomew's Hospital*. A section of the bone showed, that necrosis and exfoliation of portions of its inner lamellæ had taken place in nearly the whole length of the shaft. Around the sequestra the tibia was enlarged, partly by expansion of its texture, and partly by osseous deposit on its outer surface. The appearances of the divided tivia were such as to indicate, that the seat of the necrosis had not been in its innermost lamellæ adjacent to the medullary tissue, but rather in the middle lamellæ of the walls; and, accordingly, the cavities containing the sequestra were bounded on one side by the innermost lamellæ, and on the other side by the thickened outer lamellæ of the bone.

With respect to the treatment of this case, my regret was, that I had not for a longer time delayed the applications of the trephine to the tibia, whereby sufficient time would have been allowed for the complete separation of the dead from the living bone, for then, by freely perforating the thickened walls of the tibia, I should have succeeded in effecting the removal of the whole of the sequestra.

* First series, No. 261.

S. A. Davis, M.D.

PART II.

TUMORS OF BONE.

The morbid growths comprised in the tumors of bone exhibit a great variety of characters. Some of them are peculiar to bone; others are analogous to the growths from soft parts. In some of them, moreover, the remarkable feature is seen, of the production of tissues identical with those which occur in the natural formation of bone. Thus, with respect to the cartilaginous, and to some of the osseous tumors, the cartilage, in the first, in no way differs from fœtal cartilage; and the osseous substance, in the second, presents all the features of healthy bone.

An arrangement of the tumors of bone cannot well be founded on the place of their origin, since many of them, identical in nature, arise indifferently from periosteum, the compact, or cancellous tissue of bone. Often, indeed, concurrently with the growth of a tumor from the outside of a bone, a similar growth arises within it. Nor can an arrangement of these tumors be easily determined by their composition, two or more morbid products being occasionally united in the same tumor. Another source of difficulty in classifying the tumors of bone is the changes to which they are liable. Thus, some of these tumors, probably from weakness of their vital organization, when of large size, soften and break up in the centre, leaving only a thin shell of their original substance. Again, among certain of these tumors, especially the cartilaginous, fibrous, and osseous, transformations of structure occur; but so far in a definite order, that whilst the osseous do not change into the cartilaginous or fibrous tumors, these frequently become converted into bone.

Sufficient has probably been stated to explain why a perfect arrangement, or an unobjectionable classification, of the tumors of bone has

appeared to be impracticable. More, therefore, will not be proposed on this head than so to group the chief of these tumors as will facilitate their individual recognition. And, proceeding upon this view of the subject, I shall, in the first place, enumerate the principal products found in the tumors of bone; and then offer a history of certain tumors which are definite in their characters and progress, and, besides, are of interest and importance, from the considerations, practical or pathological, belonging to them.

PRINCIPAL PRODUCTS FOUND IN THE TUMORS OF BONE.

1. Cartilaginous substance.
2. Osseous substance, which, in composition and arrangement, may in no respect differ from healthy bone; or may present the general characters of ivory; or may be of a dull white colour and chalk-like appearance, and of such composition that it can be readily scraped or rubbed into a fine powder. When osseous substance constitutes only a part of the tumor, it is usually situated at its base, in the form either of a solid mass, or of a sort of frame-work supporting the softer constituents of which the rest of the tumor consists.
3. Encephaloid, or brain-like substance.
4. Fibrous substance.
5. Gelatinous substance.
6. Fatty substance.
7. Soft and very vascular substance, of the character of erectile tissue.
8. Fluids of various kinds—sanguineous, serous, or gelatinous.

Other morbid products are deposited in bone; namely, the material of melanosis, and of hard carcinoma, and of tubercle. But these are not usually accompanied by enlargement of the bone, or by the growth of a tumor from it. Tubercle in bone is considered under the head of scrofula. Melanosis and hard carcinoma, in bone are considered each by itself, in a separate section.

The development of entozoa in bone is in general accompanied by the enlargement of it in a manner to be properly included among its tumors. Accordingly, this subject is considered in the present section.

The production of simple membranous cysts in bone is also included in the consideration of its tumors, as these cysts occasion enlargement of the part of the bone in which they are situated.

1. TUMOR OF BONE COMPOSED CHIEFLY OF CARTILAGINOUS SUBSTANCE: ENCHONDROMA (MULLER) OSTEOSARCOMA*.

This tumor occurs in the early and middle periods of life. Generally it grows from a single bone; but occasionally from several bones of the hand or foot. In a case recorded by Müller, cartilaginous tumors arose from the bones first of one hand, then of the other, and afterwards from the bones of both feet. In a case which occurred at the General Hospital, Birmingham, a boy, seventeen years of age, had cartilaginous tumors of all sizes to that of an orange, growing from almost every digital and metacarpal bone of one hand, and from the forefinger of the other. The formation of the swellings commenced in his earliest infancy, and they were still increasing, when one hand, and the forefinger of the other, were amputated at the same instant by Mr. Amphlett and Mr. Crompton, surgeons to the hospital, the patient being under the influence of æther. At the period of the operation, the father, mother, one brother, and one sister, of the boy were living, and free from any such disease†. A similar case to the foregoing was in St. Bartholomew's Hospital, under the care of Mr. Lawrence, in a boy, from whose digital and metacarpal bones in both hands numerous cartilaginous tumors had arisen.

There are two distinct forms of the cartilaginous tumor—one growing from the outside of a bone, the other from its interior. In the instances of its occurrence in any of the larger bones, as the humerus, femur, or tibia, it usually grows from the outside of the bone, rarely within it. But, in the instances of its occurrence in the smaller bones, especially of the hand or foot, it usually originates within the bone.

When the cartilaginous tumor originates within a metacarpal or digital bone, the morbid deposit commencing in the cancellous texture,

* The term osteosarcoma is here introduced for the reason, that, in the records of surgery, many examples of the cartilaginous tumor are so designated; but various growths from bone have been comprised in this term. The first clear account of the cartilaginous tumor of bone was given by Müller, in his Essay on the Nature of Cancer, and of those morbid growths which may be confounded with it. Translated by Dr. West.

† For the possession of the amputated hand and forefinger I am indebted to Mr. Hodgson, Mr. Amphlett, and Mr. Crompton. Museum of St. Bartholomew's Hospital, First series, Nos. 262, 263.

is, in some cases, diffused through it, unaccompanied by pain or any change in the coverings of the bone indicative of the disease within it. At length, in one part, and it may be on one side only, or in the entire circumference, of the bone, its walls expand into a globular tumor, consisting of a thin osseous shell, enclosing the cartilaginous substance. The tumor, in some instances, remains small, in others it increases to the size of an orange. But, however large the tumor may be, it retains the osseous shell, which grows with the increase of the cartilage within it, and even when of its largest size, the tumor is unaccompanied by pain, or change in the surrounding tissues.

In the instances of the cartilaginous tumor growing from the outside of a bone, the exterior of the tumor is usually noduled, its cartilaginous substance is disposed in lobes, united by fibrous septa, through which the blood-vessels ramify, and a fibrous capsule encloses the tumor.

The cartilaginous substance composing these tumors is of a blueish or greyish-white colour, compact and elastic, but less firm than articular cartilage. Chemical analysis obtains from it the same results as from pure cartilage. It yields in boiling the peculiar form of gelatine designated chondrine, as constituting the base of cartilage, and it presents, in the microscope, round or oval corpuscules of the same character as those in pure cartilage.

The cartilaginous tumor is usually of slow growth, and it does not affect the general health, even when of large size, unless a disorganizing process has commenced within it. It is to be regarded as a strictly local disease notwithstanding the instances of its growth from several bones of a hand or foot; for these are so rare as not to interfere with the conclusion, that the removal of the tumor, whether growing from the outside of a bone, or from its interior, will not be followed by the growth of similar tumors elsewhere.

The discrimination of the cartilaginous tumor of bone has been found difficult when one is situated upon the humerus or femur, from the thick layers of muscle enveloping it. Its discrimination is less difficult when situated upon the bone of a finger, where it forms a firm, painless, smooth, and globular, or noduled swelling closely attached to the bone. But the difficulty here occurs of determining whether the growth is from the outside of the bone or from its interior, since the immobility, and other characters of the tumor, are in each case the same, and yet the distinction is important, as it affects the question of removing the tumor alone, or with it the bone in which it has arisen.

Some help to this diagnosis is furnished in the fact, that when there is only a single cartilaginous tumor growing from a finger or toe, its more common origin is from the outside of the bone; but when there are several cartilaginous tumors, they usually originate within the bone. In the instances of the origin of the cartilaginous substance within the bone, it is in general diffused through its cancellous texture beyond the limits of the external tumor, and accordingly it is necessary to take away the whole of the bone to ensure the complete removal of the disease.

When the cartilaginous tumor has acquired a large size, it is in general stationary, in respect to its growth and structural condition; but, in some instances, a disorganizing process has ensued in the tumor, accompanied by the following phenomena—enlargement of the subcutaneous veins ramifying upon it, softening of its central substance, ulceration of its coverings, excavation of its centre by sloughing and ulceration, accompanied by a profuse discharge of serous and fœtid fluid from an ulcerated passage in the soft parts investing the tumor. Such was the progress of a cartilaginous tumor arising from the humerus of a man fifty-five years of age, who was a patient in St. Bartholomew's Hospital*. In some cases, a cavity has formed in the centre of a large cartilaginous tumor, containing several pints of a viscid honey-like fluid†. In an instance recorded by Sir P. Crampton, a cartilaginous tumor, growing from the femur, measured six feet six inches in circumference, and in its centre there was a cavity containing several quarts of brownish fluid, apparently the result of the disorganization of the cartilaginous substance‡.

There is evidence to prove, that the cartilaginous tumor of bone, when of small size, may be influenced by local remedies; that by applying to it preparations of iodine or mercury, or of both conjointly, the gradual dispersion of the tumor may be effected.

A female, aged twenty-eight, was admitted into St. Bartholomew's Hospital, with a round tumor, the size of a hazel-nut, projecting from the front of the superior maxillary bone, just above the sockets of the canine and bicuspid teeth; it was free from pain, had been growing many months, and was still increasing. For the purpose of ascertain-

* Plate 19, fig. 4.

† Two cases of osteosarcoma of the thigh bone, by R. A. Frogley, Esq. Medico-Chirurgical Transactions, Vol. xxvi.

‡ Dublin Hospital Reports, Vol. iv.

ing the nature of the tumor, I pierced it with a grooved needle from the inside of the mouth. The sensation attendant on the passage of the instrument through the tumor assured me that it was composed of cartilage, with particles of bone dispersed through it. An ointment, containing first iodide of potassium, afterwards iodine alone, was kept constantly applied to the cheek, and during its use the tumor slowly diminished. At the end of a few weeks, when the patient left the hospital, about two-thirds of the tumor had disappeared.

Cartilaginous substance is occasionally combined with other morbid products in the tumors of bone. Of such combinations I have met with the following instances:—1. A large tumor surrounding the shaft of the tibia, one-half consisting of lobes of cartilaginous substance, with an osseous base, its other half consisting of a soft and very vascular tissue*. 2. A large tumor occupying the nasal passages, and extending through the basis of the cranium to its interior. That portion of the tumor which was within the nose consisted of a soft vascular tissue, with pieces of cartilaginous substance dispersed through it, whilst that portion of it which was within the cranium consisted of lobes of cartilaginous substance with osseous substance in its centre†. 3. A large tumor surrounding the femur, and apparently originating within it, consisting of a mixture of encephaloid and cartilaginous substance, with portions of osseous substance dispersed through it‡.

2. OF THE TUMOR OF BONE COMPOSED CHIEFLY OF OSSEOUS SUBSTANCE.

Of this tumor there are varieties; one ordinarily denominated Exostosis; the other designated by Müller, who first described it, the Osteoid Tumor.

EXOSTOSIS.

This tumor occurs mostly in young and middle-aged persons. It is recognized by its hardness, freedom from pain, slow growth, the healthy condition of the surrounding parts, and the absence of constitutional derangement. The cellular tissue around the tumor is, in most instances, unaltered, but occasionally it is condensed into a capsule.

* Plate 15, fig, 3. † Plate 13, fig. 4, and Plate 17, fig. 3.
‡ Museum of St. Bartholomew's Hospital, First series, Nos. 97, 98.

Exostosis consists of a true bone, with compact and cancellous tissue, in varying proportions. Its microscopic and its chemical characters are the same as those of originally formed bone. But exostoses vary in their degree of hardness, and, to some extent, in the relative proportions of their ingredients. Dr. Bostock analysed for me an exostosis, and reported that it differed from ordinary bone, in containing a smaller proportion of animal matter and carbonate of lime, and a considerably increased proportion of the phosphate of lime. Valentin and Lassaigne have stated, that in some exostoses they found the phosphate of lime to be considerably less than in healthy bone, whilst the proportion of carbonate of lime was considerably increased*. It is, however, probable, from the observations of Dr. Stark on the proportions of animal and earthy matters in bone generally†, that the varying hardness of exostoses depends less on variations in the proportions of their constituents than on the mode in which they are arranged and held together; in this view, therefore, we are to regard the varieties of exostoses, some consisting of cancellous tissue filled by an oily fluid, surrounded by compact tissue, others consisting of compact tissue throughout, others having the yellowish-white colour, with the smoothness and compactness of ivory. And Dr. Paget has observed a relation in the texture of exostoses with that of the bone whence they grow: accordingly that the ivory-like exostosis growing from the hardest bone, its frequent situation is upon the cranium, especially near the orbit, into the cavity of which these ivory exostoses often project.

Most exostoses have cartilage for their base and primordial structure. The osseous substance is deposited in the centre of the cartilage, and, as the tumor increases, the layer of cartilage around the osseous substance, becoming gradually thinner, ultimately disappears, and it may be expected that the growth of the tumor will then cease. It is probable that, in some exostoses, the base and primordial structure is fibrous tissue alone. Most of the exostoses I have examined, which grew from the last bone of the great toe, appeared to be of this kind; but I have also seen this exostosis surrounded by a thin layer of cartilage. And there is a third form of exostosis, without either fibrous tissue or cartilage, which is but an outgrowth from, or hypertrophy of, a natural process of bone. An exostosis of this kind was removed from the front of the tibia, which was evidently but an outgrowth from

* Beitrage zur Physiologischen und Pathologischen Chemie und Mikroscopie, v. Dr. F. Simon. Berlin, 1843.

† Edinburgh Medical and Surgical Journal, April, 1845.

its tuberosity, and such has appeared to be the character of the exostoses arising from the processes or ridges of bone, giving insertion to tendons. These osseous growths are not apt to increase to a large size, and, in consequence, they are less likely to require removal than the genuine exostoses having a cartilaginous base. It appears, moreover, from the observations of Rokitansky, that the ivory exostosis, usually growing from the cranium, is of this kind; accordingly, that it has no cartilage or other primordial structure, and that, at its commencement, when of the smallest size, it exhibits throughout the same hard texture as when it has acquired its maximum growth.

It appears almost certain, that, during the growth of an exostosis, the surface of its attachment to the bone is not in any instance extended, and, accordingly, that the increase of the tumor takes place only upon its circumference, as might indeed be expected, because here is the cartilaginous capsule which is the source of its growth. Practically, as it concerns the consideration of the difficulty to be apprehended in the removal of the tumor, this point is of much interest; for, if the statement here made be true without exception, we may be sure that the increasing size of an exostosis is not accompanied by an extension of its attachment to the bone.

The question may arise, what is the distinction, if any, between a growing exostosis and an ossifying enchondroma? Both are usually noduled on their exterior, and the chemical characters of their constituents were found to be the same in specimens which Mr. Taylor examined for me, both being genuine cartilage, composed of chondrine and gelatine in varying proportions; but in the microscopic characters of their cartilages, these differences were noted by Mr. Quekett,—that, in the ossifying enchondroma, there were many separate points of ossification, whilst, in the growing exostosis, there was only a centre of ossification, and its cartilage was mixed with fibrous tissue.

Exostoses vary much in figure. Some are attached to the bone by a narrow neck, others by a broad or lengthened base, especially when growing from the front of the femur. Occasionally, exostoses are movable, either in consequence of the tumor having a narrow cartilaginous neck, or from the neck of the tumor having been broken in the movements of the part, the fractured surfaces then become polished, and forming a sort of joint. This had occurred in the neck of a movable exostosis, which was removed by Mr. Lawrence from the lower and inner part of the femur.

The growth of exostoses is in general irregular. Often they are sta-

tionary for a considerable period, and then again increase. It cannot be determined by the duration or size of an exostosis, whether it consists chiefly of cartilage or bone. Its growth may have ceased at an early period, when its cartilage had wholly disappeared, and then, although of small size, it would consist wholly of bone. The ivory exostosis growing from the skull rarely becomes larger than a marble; but elsewhere it has grown to a large size. When it has exceeded its usual size upon the skull, it has generally become thick and round at its base, and tapering to a point, thus acquiring a horn-like form. There is, however, in the anatomical museum of the University of Cambridge, an example of a large ivory exostosis, filling the nasal and orbitar cavities, and projecting on the outside and in the interior of the skull, which appears to have commenced either in the diploe of the cranial bones or in their inner table, their outer table being expanded over part of the tumor.

Exostoses, in some instances, appear to be the consequence of violence to the part. A man in St. Bartholomew's Hospital had a large exostosis growing from the lower and inner part of the femur; and he stated that he had been kicked by a horse in that situation shortly before the tumor commenced.

Instances are not infrequent of more than one exostosis growing from a bone; also of many exostoses growing from various bones in the same individual. There are also instances of exostoses occurring in several members of the same family; also in children, one of whose parents were similarly affected.

The diagnosis of exostosis is an important part of its history. The hardness of the tumor, its slow growth, freedom from pain, and the absence of constitutional derangement, are its ordinary characters. If the tumor is painful, if it is soft at one or more points, if its growth has been rapid, or if the health is deranged—in any of these circumstances there would be reason for suspecting the tumor not to consist simply of osseous substance.

An exostosis growing from the bone of a finger or toe, may be, with difficulty, distinguishable from the tumor resulting from expansion of the walls of the bone around a morbid deposit within it. This difficulty occurred to Dupuytren, in a case where there were two tumors, one the size of a hen's egg, which had been nine years growing upon the second phalanx of the forefinger; the other, of more recent date, the size of a hazel-nut, growing upon the metacarpal bone of the same finger. Dupuytren observed, that if the tumors were simple exostoses,

amputation of the finger, upon which the larger tumor had formed, would be sufficient; and that the smaller tumor of the metacarpal bone, at present causing little inconvenience, would probably be stationary. In this view he removed only the finger. But the tumor upon it proved not to be a simple exostosis; it consisted of the walls of the bone expanded around a fatty substance, deposited within it*.

An exostosis may be inconvenient, simply by its magnitude; but in general it is so, by interfering with the adjacent nerves, blood-vessels, or other parts. In the instance of an exostosis growing from the lower and inner part of the humerus, severe pain was felt along the forearm and hand, in the direction of the ulnar nerve; and in another case, I found, on dissection, the ulnar nerve split into two branches by a small exostosis, which penetrated it. A man in St. Bartholomew's Hospital had an exostosis growing from the posterior surface of the clavicle. He suffered no inconvenience from it whilst the arm was at rest, but directly it was moved he suffered acute pain in the direction of the axillary plexus of nerves, and its branches. Mr. Mayo showed me a patient in the Middlesex Hospital, in whom an aneurism was supposed to have arisen from the subclavian artery; but, upon more careful examination, an exostosis was discovered growing from the first rib, pushing the artery forwards and flattening it. Upon the front of the swelling, the pulsation was strong and extended over a large space; but at its sides no pulsation could be felt. The pulsation of the artery in the axilla was feeble. In the brachial, radial, and ulnar arteries, no pulsation could be felt. Sir Astley Cooper has recorded a case in which an exostosis growing from the lower cervical vertebræ, and extending towards the clavicle, compressed the subclavian artery. The pulse at the wrist was in consequence stopped, and gangrenous spots appeared in the arm†.

Other organs may be affected by their contiguity to exostoses. Andral has related a case wherein difficulty of deglutition was experienced from compression of the œsophagus, by an exostosis growing from the body of a vertebra‡. And there is an instance recorded by Dr. Reid, in which a conical exostosis, growing from the posterior part of the odontoid process of the second cervical vertebra caused fatal compression and softening of the spinal cord§.

* Journal Universel et Hebdamodaire, Décembre, 1833. Compte rendu de la clinique chirurgicale de l'Hotel Dieu.

† Surgical Essays, p. 173.

‡ Pathological Anatomy, Transl Vol. ii. p. 278.

§ London and Edinburgh Journal of Medical Science, March, 1843.

An exostosis growing from the inner table of the skull, has been the immediately exciting cause of epilepsy. In a boy, admitted into St. Thomas's Hospital on account of epileptic fits, a spot of the skull was discovered where pressure gave much uneasiness. Here the trephine was applied. At the instant of raising the circle of bone, he had a sharp epileptic fit; but this was the last. From the inner table of the portion of bone removed, a spiculum, a quarter of an inch long, projected, pressing upon the dura mater*. In a case recorded by Boyer, an exostosis growing from the os pubis and compressing the neck of the bladder, caused retention of urine, for the relief of which a catheter could not be introduced†. M. Jules Cloquet, in examining the body of an aged female, found the symphisis pubis ossified, and a bony growth projecting from its posterior surface into the cavity of the bladder. The pressure of the tumor had caused the absorption of the coats of the bladder: hence, on opening its cavity, the bony tumor was seen projecting into it, covered only by a thin layer of fibro-cellular tissue, which, at the base of the tumor, was continuous with the mucous membrane of the bladder‡.

The growth of an exostosis from the bone of a toe requires particular notice, on account of the inconvenience it usually occasions§. It is rarely found upon any other than the great toe; and it generally grows from the upper surface, margin, or extremity of the last phalanx, raising the nail and projecting from beneath it. In some instances, the exostosis has begun to grow shortly after the toe has been struck against a stone or other resisting body; in others, it has been thought to be owing to the pressure of a tight boot. In some cases, the exostosis is attached to the bone by a narrow neck, and in others by a broad base. Pain and lameness are the usual consequences of the displacement of the nail, by the increase of the tumor beneath it. The exostosis has been, in some instances, mistaken for a warty excrescence growing from the soft parts; and in others, for the ordinary fungous excrescence springing from beneath the nail. A patient in St. Bartholomew's Hospital had a small red fleshy tumor projecting from the end of the great toe, which was preceded by an abscess beneath the nail. The toe was amputated, and the tumor found to consist of fibrous tissue, with an osseous base attached to the last phalanx.

* Further Enquiry concerning Constitutional Irritation, by B. Travers, p. 285.

† Mémoires de l'Académie de Dijon.

‡ Pathologie Chirurgicale, Plate ix. fig. 7.

§ The first distinct notice of this exostosis is in a paper, by Mr. Liston, in the 26th volume of the Edinburgh Medical and Surgical Journal.

In the treatment of exostosis we have to consider, first, the means of arresting its growth, and secondly, the question of removing it by operation. Very little reliance can be placed on depletory remedies in stopping the growth of an exostosis. There are, however, instances of exostoses accompanied by turgescence of the surrounding veins, and even by enlargement with pulsation in the adjacent arteries, and increased heat in the parts. Under these circumstances, the persevering use of leeches and evaporating lotions might be serviceable. There have also been cases in which counter-irritation established close to an exostosis has appeared to be of service. A boy, under the care of Mr. Abernethy, in St. Bartholomew's Hospital, had an exostosis growing from the middle of the humerus; it was painful and increasing. An issue was made at the base of the tumor, and as soon as the discharge from it was established, the exostosis became free from pain, and ceased to grow. But, in other cases, I have directed the application of issues close to exostoses without influencing their growth. I have seen instances in which the application of iodine and mercury to an exostosis was followed by the diminution of it; and cases are recorded in which friction and compression of the tumor have had the same effect. In the instances of success from such measures, it is probable that the tumors consisted chiefly of cartilage, for, upon the osseous tissue, it is not likely that they would have any effect.

An exostosis being a growth from sound bone, and, in general, a strictly local malady, its removal by operation may be undertaken, with the expectation that it will not be reproduced. I have known numerous instances in which the removal of the tumor was not followed by any reproduction of it; and I have seen a few instances in which the exostosis was reproduced at the same spot, in consequence, it was thought, of the tumor not having been completely removed.

It may be stated, that absolute security against the reproduction of an exostosis can be obtained only by the removal of every part of its circumference. If but the smallest portion of the exterior of the exostosis with its cartilaginous capsule be left, reproduction of the tumor will be, at the least, not an improbable occurrence.

When an exostosis becomes inconvenient, from its size and interference with the contiguous parts, the patient is likely to solicit its removal. The propriety of undertaking the operation will, of course, depend on the size and connexions of the tumor; and, in deciding the question, it is to be recollected that exostoses often cease to grow before they have acquired such a size as to be materially inconvenient. The

growth of the tumor may stop whilst it is still small, and, in consequence, no operation be required.

In removing an exostosis, the first step is to denude it to its base; and, usually, this is easily effected, as the cellular capsule of the tumor is but loosely adherent to it. The next step is to detach the tumor from the bone. For this part of the operation, strong knives, cutting forceps, and saws of various shapes, must be provided, for until the base of the tumor is exposed, and its form recognized, it will be uncertain with what instrument the division of it can be best effected. When an exostosis is covered by muscle, the fibres should be cut transversely, because the retraction of them will facilitate the exposure of the tumor; also, because suppuration is almost sure to occur at the bottom of the wound, and the retraction of the cut edges of the muscle will facilitate the discharge of the matter, and prevent the evil of its burrowing among the surrounding parts.

After the removal of an exostosis, especially when deep-seated, it is not expedient to approximate the divided edges of the integument, in the view of obtaining their adhesion; since, in the exposure and removal of the tumor, so much injury is usually done to the surrounding cellular tissue, that suppuration through it will almost certainly ensue. The wound should be simply covered with folded damp linen; and, by this means, the healing of it will be completed in a shorter time than if the adhesion of its sides had been in the first instance attempted.

When, from the situation of an exostosis, the complete removal of it by the saw, or other cutting instrument, cannot be effected, the potassa fusa or nitric acid may be applied to the remaining portion of the tumor, in order to produce its exfoliation, and the same measure may be adopted, if the surface of the bone, from which an exostosis has been removed, should be discovered to be unsound. And there have been instances in which the complete removal of an ivory exostosis from the cranium being found impracticable, on account of its extreme hardness, the application of potassa fusa to the remaining part of the tumor was followed by the separation of it.

In the instances of exostosis growing from the last bone of a toe, the propriety of interfering with it will depend on the amount of pain and lameness it occasions. I have seen cases where it occasioned no inconvenience; usually, however, it causes so much pain that the patient solicits its removal. It has been a question, whether only the tumor should be removed, or the bone whence it has arisen, be amputated. Experience has appeared to be in favour of the latter measure; for in

some of the cases, where the tumor alone had been removed, it is stated to have been reproduced. When the exostosis arises from the last bone of the great toe, the amputation should be performed through the articulation of the first with the second phalanx; but when it grows from the last bone of any of the other toes, the amputation should be performed between the bones of the first and second, rather than between the second and third phalanx, on account of the small size of the latter.

Hitherto the objection to removing, with the exostosis, only the portion of the phalanx from which it grows, has been the severity of the pain attendant on the division of the sensitive structures beneath the root of the nail; but with the use of chloroform or æther, this objection being removed, the mode of operating in these cases successfully adopted at St. Bartholomew's Hospital has been as follows: first, to soften the nail by enveloping the toe for twenty-four hours in a poultice, then, to pass a scalpel from the end of the toe, close upon the under surface of the phalanx, almost to its base—a flap of the soft parts will thus be formed; next, the knife is to be passed, just beyond the exostosis, across the softened nail and through the subjacent tissue to the bone; and, lastly, by the cutting forceps, the phalanx is to be divided transversely, near its base. The flap of skin being brought over the wound, and confined there by a couple of stitches, will readily unite to the subjacent parts. The advantages of the foregoing proceeding are, that it does not interfere with either the flexor tendon or the last joint of the toe; and that it leaves the bulbous end of the toe uninjured; in fact, it leaves the toe not otherwise altered than by a little shortening of it.

When an exostosis arises from the femur, close to the knee-joint, it may be difficult to decide whether its removal can be effected without opening the joint. The following case of this kind occurred in St. Bartholomew's Hospital. A man, aged twenty-five, had an exostosis growing from the lower and front part of the femur, which commenced five years previously. The tumor, increasing, had of late interfered with the knee-joint, occasioning pain in it, and distension of the synovial membrane by fluid. The tumor was oblong, the long diameter of its base being in the axis of the femur, and measuring about four inches, the breadth of its base about two inches. The increase of the tumor, in such a direction that it projected into the knee-joint, induced the man to solicit its removal. Its connexions were carefully examined, with reference to the question of its being possible to remove it,

without injuring the joint; and it was decided that the operation might be safely undertaken.

An incision was made through the rectus and cruræus muscles to the base of the tumor, on the side most remote from the knee-joint. But in doing this, though with all possible caution, the joint was opened, and it was now discovered that the synovial membrane, in yielding to the accumulation of fluid in the joint, had extended upwards upon the tumor, and some way beyond it upon the front of the femur. With much difficulty, on account of the deep situation of the tumor, the breadth of its base, and the hardness of its texture, I effected its removal by means of a chisel and cutting forceps. The inflammatory fever, immediately consequent on the operation, was not severe; but as this subsided, there was no return to health. Constitutional derangement of another kind ensued; its prominent features were rigors, collapse, pain in the head, cramps in the limbs, and extreme prostration of nervous power; and it soon became evident, that suppuration had taken place through the subcutaneous cellular tissue of the whole limb, from the hip to the foot. At the end of the third week from the operation, the patient died.

On examining the limb, a large suppurating cavity was found in the lower part of the thigh communicating with the knee-joint, the synovial membrane and cartilages of which were in great part destroyed. There was, however, a sufficient portion of the synovial membrane left to show, that it had extended upwards upon the front of the femur to the extent of five inches above the articular cartilage, and consequently much beyond the limits of the exostosis*.

In this case, an incorrect view was taken of the disposition of the synovial membrane with respect to the exostosis, and consequently the danger of opening the knee-joint was not rightly estimated. But this error of diagnosis admits of the following explanation. When the man was admitted into the hospital, there was a large accumulation of fluid within the knee-joint, which, under the influence of rest, leeches, and cold lotions, wholly disappeared; but the synovial membrane did not contract to its former dimensions. We expected that it had done so, and accordingly that the operation might be undertaken, without risk

* This tumor was apparently of the character of an outgrowth, or hypertrophy of bone, for it consisted of cancellous texture, which, at the base of the tumor, was continuous with the cancellous texture of the femur. Representation of the portion of the femur from which the tumor was removed, Plate 14, fig. 2.

of injuring the joint. Subsequently, in the hospital, I removed an increasing exostosis from the lower and inner part of the femur; but here there had been no accumulation of fluid within the knee-joint, and consequently no extension of the synovial membrane beyond its natural limits.

When proceeding to remove exostoses, it is well to bear in mind, that in certain situations they are in general very hard, and in consequence not easily divided. An exostosis growing from the lower jaw will probably be dense, from its relation to the texture of the bone whence it grows. But the exostoses growing from the skull, including those which project into the orbit, have been found of so hard a texture that they could not be divided, either with the saw or cutting forceps.

Boyer alludes to two instances of exostosis, in which the tumor spontaneously separated from its connexions*. Another case has been recorded by Mr. Hilton, in which a large ivory exostosis spontaneously separated from the bones of the face. The loosening of the tumor commenced several years before its separation was completed, and the process of separation was not accompanied by pain or hæmorrhage. The tumor weighed fourteen ounces. Healthy granulations arose from the parts with which it had been connected†. It is doubtful whether, in these instances, the osseous tumor was actually a growth from bone. More probably, it was formed in the cellular tissue, and, by suppuration in the parts around, became gradually detached from its connexions. In a case which occurred in St. Bartholomew's Hospital, suppuration appeared to have taken place in the centre of a large exostosis. The tumor was attached to the head of the tibia; it consisted of a solid mass of bone, with a suppurating cavity in its centre. From this cavity, an ulcerated passage extended through the thick osseous substance forming the walls of the tumor, and through the investing soft parts, to the outside of the limb‡.

OSTEOID TUMOR.

More than general observation had not been directed to the varieties of osseous tumors, when the description of one of these, not before noticed, was published by Müller, under the designation of the osteoid

* Traite des maladies chirurgicales, Tome iii. p. 554.
† Guy's Hospital Reports, September, 1836.
‡ Plate 12, fig. 1.

tumor*. But the more appropriate designation of this disease is the Malignant Osseous Tumor, as marking the prominent feature which distinguishes it from the innocent osseous tumor, or exostosis.

I have had the opportunity of seeing three instances of this disease. In two of them, it surrounded the lower part of the femur; and in the third, the upper part of the tibia. The disease occurred in individuals between the ages of thirty and forty-five. One case had been eighteen years in progress; and in the two others, it could not be ascertained that the disease had existed more than a few months.

In all the cases, the tumor of the bone was accompanied by similar morbid deposits in the adjacent and in distant absorbent glands, converting them into chains of osseous tumors; and in two of the cases, there was an additional feature of malignancy in the combination of the primary tumor of bone with similar growths in distant organs and tissues. In each case, the disease originated within the bone, and accordingly the tumor around it was accompanied by similar growths within its medullary tube and cancellous texture.

The osseous substance in these tumors is either of a yellow colour and ivory-like texture, or it consists of a dull white, chalk-like substance, which can be scraped or rubbed into a powder. The osseous substance is united to a soft tissue, which usually constitutes the exterior of the tumor, and besides fills the interstices in its harder constituent. The soft tissue is of a greyish-white colour, and, when examined by the microscope, is found to be fibrous. But in some instances, the soft tissue of these tumors has closely resembled the firmer sort of encephaloid deposit. It was so in one case, where the osseous tumor of the tibia was combined with growths apparently of an encephaloid nature in distant parts of the body†.

There is clear evidence of the malignancy of this tumor of bone, and accordingly we shall desire to know its characters in the early stage of the disease, in order that the amputation of the limb in which the disease is situated may be performed whilst the absorbent glands adjacent to it are uncontaminated. Difficulty will be experienced in the diagnosis; still, however, there are characteristic features of this tumor, which it may be well here to recapitulate. They are—

* Ueber ossificirende Schwämme oder Osteoid Geschwülste, von Joh. Müller, Archiv für Anatomie, &c. 1843.

† In this instance, however, the morbid substance was not examined by the microscope. In all the instances where this was done by by Mr. Paget, he found the soft constituent of these tumors to be distinctly fibrous.

First, The tendency to its growth around the lower part of the femur, just above its condyle, and around the upper part of the tibia, just below its head.

Secondly, The tendency of the tumor to assume an oblong, rather than the globular, form which belongs to many other tumors of bone.

Thirdly, The absorbent glands, when contaminated in this disease, assume the form of hard, isolated, and movable tumors.

This tumor closely surrounds the bone from which it grows, and consequently it is immovable. In this particular, however, and in the firmness of its feel, it does but resemble many of the fibrous tumors of bone, from which, therefore, its distinction may not be easily established.

In illustration of the foregoing history of the osteoid tumor, the following instances of it are related.

1. *Malignant Osseous Tumor of the Tibia.* A woman, thirty years of age, was admitted into St. Bartholomew's Hospital, with a hard and immovable tumor, occupying the upper half of the leg; and in the popliteal space there were two smaller, hard, but movable tumors. The large tumor had been eighteen years in progress, and the small tumors were of recent formation. The malignant character of the disease was indicated by sallowness of countenance and collapse of the features. The limb was amputated through the lower third of the thigh. The large tumor was found to consist almost wholly of bone, which, in one part, presented the yellow colour and density of ivory, and in another was cancellous. The ivory-like portion of the tumor was continuous with the same kind of deposit within the medullary tube of the tibia. The walls of the tibia were yellow, and of ivory-like density. The exterior of the tumor was composed of soft substance, which, in some parts, was fibrous, and in others, encephaloid. The smaller tumors in the ham were composed of osseous substance, partly ivory-like, and partly cancellous; and it appeared probable that they were formed by ossification of the absorbent glands. Within the medullary tube and cancellous texture of the femur, there were deposits of ivory-like bone, and of soft substance, in some parts fibrous, in others encephaloid.

The stump healed soundly. Cough and difficulty of breathing ensued, and continued to the death of the patient, two months after the removal of the limb.

Numerous isolated ivory-like deposits, mixed with fibrous and ence-

phaloid substance, were found within the medullary tube of the remaining portion of the femur. The femoral, iliac, and cervical absorbent glands were converted into fibrous and encephaloid substance, with osseous deposits in its centre. Many encephaloid growths were found in the pleura, pericardium, and lungs; and there was a large mass of the same substance deposited around and within the coats of the vena cava superior*.

The fact will here be observed of morbid growths occurring simultaneously in two bones of a limb. In the tibia, these growths were accompanied by tumor; in the femur they were not: here, consequently, there was no sign of their existence.

2. *Malignant Osseous Tumor of the Femur.* A man, aged thirty, was admitted into St. Bartholomew's Hospital, under the care of Mr. Lawrence, with a swollen and painful state of the right knee-joint, consequent on a fall, for the removal of which, antiphlogistic treatment was successfully employed; but shortly afterwards, a painful swelling arose immediately above the knee, and gradually extended around the lower third of the thigh. A softening of the swelling at one part being discovered, an incision was made into it, from which, arterial blood freely flowed. Pulsation was now discovered in the swelling; and at the same time it was observed, that the leg had become œdematous, and that the toes were colder than in the opposite limb. The femoral artery was then tied. Pulsation in the tumor ceased, and its size gradually diminished; but after some time it again enlarged, sloughing of the skin and central substance of the tumor ensued, but unaccompanied by hæmorrhage. The man gradually sank from exhaustion.

On examining the limb, I found the tumor to consist of a compound of soft fibrous and dense osseous substance, the latter extending completely around the femur. The whole series of femoral, inguinal, and lumbar absorbent glands were converted into osseous tumors. The femoral and popliteal vessels were sound.

In this case, the tumor of the femur and the tumors of the absorbent glands were identical in structure, both being composed almost wholly of a solid, dull white, chalk-like osseous substance, which, in the femur, was continuous with a similar deposit in the medullary and can-

* Representations of some of the specimens from the above case, Plate 19, figs. 1, 2, 3.

cellous tissue of all that part of the bone which was surrounded by the tumor*.

3. *Malignant Osseous Tumor of the Femur.* I admitted into the hospital a man, aged forty-five, having a solid tumor closely surrounding the lower third of the femur. He stated that it had been growing not more than four months; but probably, it was only within this period that his attention had been directed to the tumor, on account of its being painful. His countenance was sallow and his features shrunk. In the groin, especially above Poupart's ligament, there were several hard, movable, and not painful tumors. The tumor of the thigh was oblong, immovable, and so firm that it seemed to be composed chiefly of osseous substance. The disease was considered to be malignant, and accordingly the removal of the limb seemed justifiable only on the ground of the man desiring to take the chance of his life being prolonged by the operation, when made acquainted with the circumstances of his case. He left the hospital, and in a month afterwards returned to it, when the tumor had extended up the thigh to its middle. He now, although dissuaded from the operation, yet so strongly urged its performance, on account of the severe pain in the tumor, that I yielded to his solicitations, and amputated the thigh in its upper third.

On examining the tumor, I found it to consist of osseous substance and of fibrous tissue. The osseous substance was yellow, and of ivory-like texture; it formed the deeper part of the tumor, and was continuous with masses of ivory-like osseous substance, which nearly filled the medullary tube of the femur to the extent of the tumor surrounding it. The fibrous substance, constituting the exterior of the tumor, extended into the spaces intervening between irregular portions of the osseous substance. In the muscles, and in the cellular tissue adjacent to the tumor, there were many circumscribed deposits, varying in size from that of a pea to that of a hazel-nut, composed wholly of fibrous tissue.

The man did not survive the operation more than two months. The wound of the amputation had nearly healed, but there was a large abscess deep in the thigh, in the direction of the psoas and iliacus muscles, and communicating with the hip-joint, through the bursa underneath the psoas. The articular cartilage of the hip-joint was in great part destroyed. The tumors in the groin, occupying the line of the

* Museum of St. Bartholomew's Hospital, First series, Nos 108, 109, 110. With reference to the remarkable occurrence of pulsation in this tumor, the case will be again noticed in the section on the Tumors of bone which pulsate.

inguinal and lumbar absorbent glands, consisted of fibrous tissue, with osseous deposits in the centre of some of them. Numerous tumors, presenting the same characters as those in the groin and abdomen, were dispersed through the lungs, immediately beneath the pleura. Within the medullary tube of the small portion of the femur which had been left, and at some distance from its amputated extremity, there was a circumscribed fibrous growth of the same character as that which was the chief constituent of the other tumors.

In this case, it will be observed, there were isolated morbid growths within different parts of the femur, in addition to the similar morbid deposits in adjacent and distant absorbent glands, and in the lungs. It should also be noticed, that the disease existed in only one bone; other bones were examined, but they were found healthy.

3. TUMOR OF BONE, COMPOSED CHIEFLY OF BRAIN-LIKE, OR ENCEPHALOID SUBSTANCE—CARCINOMA MEDULLARE—FUNGUS MEDULLARIS (MULLER).

This tumor is of frequent occurrence; it is usually a primary disease, originating within the bone, and occurring in general before the age of forty, but occasionally at a later period. Its growth is, in some instances, rapid, attended with severe pain and wasting of the body; whilst in others it is slow, with but little pain, or disturbance of the health; thus, in some cases, it has been a disease of only a few months' growth, whilst in others, it has been several years in progress. The disease, in its advance through the bone, is, in most instances, accompanied by absorption of the walls, but occasionally by the expansion of them into a cyst enclosing the encephaloid substance. In some rare instances, the expansion of the walls of the bone has been accompanied by increase of their thickness, giving to the tumor the characters of a solid mass of bone*. More commonly, the expanded walls of the bone are partially absorbed, and the tumor is in consequence firm and resisting in some parts, soft and elastic in others. The softness and elasticity of the tumor have often induced the belief that it contained fluid, and accordingly it has been punctured with the effect of discharging blood freely from it, but without diminution of its bulk. Often it happened, that when the encephaloid disease had in part penetrated the walls of the bone, the remaining portion of them suddenly gave way,

* Museum of St Bartholomew's Hospital, First series, Nos. 159, 160.

in the manner of a spontaneous fracture, after which the limb rapidly enlarged, from the accumulation of encephaloid substance around the bone; and the pain, which was before severe, almost wholly subsided, apparently because the morbid deposit was no longer confined within the walls of the bone or its periosteum.

The encephaloid tumor of bone occasionally attains a very large size, the extent of the morbid deposit being apparently limited only by the degree to which the skin covering it will yield; and in some instances it has been diffused through the entire limb, occasioning enlargement of the arm, thigh, or leg, to such a degree that, in its circumference, it has equalled the body of the patient. When at length the skin covering the tumor inflames, it usually ulcerates at one or more points, and the openings give issue to blood, or to a soft bleeding fungus. In some cases, suppuration occurs through the coverings of the tumor, followed by the profuse discharge of a fœtid fluid, consisting of a mixture of pus, encephaloid substance, and blood.

The absorbent glands contiguous to the encephaloid tumor of bone are in general not readily affected. I have seen instances of this tumor of enormous size in the thigh, without any change in the inguinal glands.

The encephaloid tumor frequently originates in the cancellous texture of the condyles and adjacent part of the shaft of the femur, or in the cancellous texture of the head of the tibia; and in either situation, it is liable to be mistaken for ordinary disease of the knee-joint. The commencing symptoms of the encephaloid disease have been, in some of these cases, exactly the pain, stiffness, and slight swelling of the joint which usually accompany inflammation of the synovial membrane; and at a more advanced stage, the soft, elastic, encephaloid tumor, occupying the whole circumference of the joint, has been mistaken for the swelling of it, consequent on thickening of the synovial membrane. Even in instances where the encephaloid tumor has acquired a large size, its nature has not been suspected, and consequently amputation of the thigh has been performed in the belief that the case was one of ordinary disease in the knee-joint. In an instance, moreover, of encephaloid disease originating within the patella, it presented the ordinary characters of the bursal tumor upon the knee, and the removal of the tumor was undertaken, when it was found to consist of encephaloid substance and fibrin, enclosed in a cartilaginous shell*. The difficulty

* Observations pour servir à l'histoire du cancer des os. Par le Professeur Dubreuil, Hebdomadaire de Médecine, Juin, 1835.

of the diagnosis may lie in the opposite direction. There are instances of suppuration around the knee-joint which present many of the features of encephaloid disease. A case of this kind, which I saw, occurred in a child seven years old. Without apparent cause, a large swelling had, in the course of a few months, formed around the front and sides of the knee-joint; it was every where soft and elastic, but without the feel of fluctuation on pressure; and the veins ramifying upon it were large and tortuous. It was for some time uncertain whether this was an instance of encephaloid disease, or of simple abscess; it proved to be the latter; but the suppuration was deep, between the muscles and synovial membrane of the knee-joint, and it was to this circumstance that the indistinctness in the characters of the disease appeared to be owing.

The encephaloid tumor of bone consists of the peculiar morbid deposit implied by its name, in all the varieties of colour and consistence belonging to this deposit in other organs; it is, therefore, in different instances, white, yellowish, or grey, or dark red, from the mixture of blood with it. Its consistence varies much: in some instances it is as soft and compressible as fœtal brain; and in others, it presents the firmness, with the elasticity, of fresh adult brain. Often the encephaloid substance is mixed with other morbid products: thus, part of the tumor is occasionally composed of a dark-brown soft substance, not encephaloid in its characters, with cavities in it filled by serous or gelatinous fluid, or with blood. In some instances, so large is the proportion of serous or sanguineous fluid mixed with the encephaloid substance, that the enlarged limb in which the disease is seated, appears to consist of nothing else than a bag of fluid. Osseous specks and fibres are often mixed with the encephaloid substance, the osseous matter being, in some instances, apparently, a new deposit, and in others the remains of the original fabric of the bone. In some cases, the osseous substance forms the base of the tumor; and in others, it is disposed in the form of a network, extending through the tumor, the interstices of which are filled with encephaloid substance.

In two instances of limbs amputated on account of encephaloid disease originating in the condyles of the femur, I found the unsoundness of the bone continued through its shaft to the amputated extremity—also a similar unsoundness of the tibia—each bone presenting throughout an enchymosed appearance in its compact tissue. From these facts we learn that the encephaloid tumor is, in some instances, combined with unsoundness of the vascular structure of the bone, and that,

although the tumor may be confined to a portion of the bone, the unsoundness of vascular structure may extend through the whole of it. Further, the practical conclusion from the foregoing would appear to be, that after amputating a limb on account of encephaloid disease originating in the bone, if the bone were divided, the reproduction of encephaloid disease would probably ensue from its remaining portion. But in the two cases just mentioned, this did not happen; in each, the stump healed soundly, and there was no return of disease. Still, the ascertained fact of the encephaloid tumor being occasionally combined with unsoundness of the bone to an indefinite extent, is sufficient to warrant the rule, that, in such cases, the amputation should, if possible, be performed, not through the bone in which the disease originated, but either through the contiguous joint, or above it; that when, for example, encephaloid disease has originated in the radius or ulna, amputation should be performed through the elbow-joint, or above it; that when the disease has originated in the humerus, amputation should be performed at the shoulder-joint; and that in the instances of this disease occurring in the lower end of the tibia, amputation should be performed above the knee-joint.

The diagnosis of the encephaloid tumors of bone may be obscured by the circumstances of its commencement; thus it is, in many instances, directly preceded by local injury happening to a person in perfect health, and followed by slight inflammation in the part, upon the subsidence of which the malignant disease is gradually developed. The following is a remarkable instance of this.

Encephaloid Tumor following Injury of the Knee. A boy, aged ten years, was admitted into St. Bartholomew's Hospital, having four days previously fallen upon his knee; since which, the joint had been stiff and painful. From the examination of the limb it was concluded that there was either a fracture of the femur just above the condyles, or a separation of the epiphysis. The limb was confined in splints. A swelling of the soft parts around the knee-joint gradually arose, accompanied with heat and tenderness in the skin covering it. The swelling became so soft that it was supposed matter had formed in it; accordingingly it was punctured, but only blood issued from the opening. The swelling gradually extended up the thigh, enlarging it to the dimensions of the thigh of an adult, but the absorbent glands in the groin were unaffected. At length the skin gave way towards the ham, and an ulcerated passage into the tumor here formed, from which fœtid matter was profusely discharged. Four months after the commence-

ment of the disease, the boy died. On examining the thigh, encephaloid substance was found extensively diffused through the cellular tissue between the muscles and the bone. The shaft of the femur was separated from the condyles, and the unsoundness of the bone at this part indicated that the disease had commenced within it.

It is to be recollected that the encephaloid tumor of bone is, in one case, of slow, and, in another, of rapid growth; in one case attended with pain and disturbance of the health, and in another with neither of these symptoms; that in one case the coverings of the tumor feel soft throughout, in another firm in the situations where osseous substance enters into its composition: moreover, that the encephaloid matter has been found enclosed in an osseous cyst, which, in one case, was thin and crepitating, and, in another, so thick as to give to the tumor the solidity of an exostosis. Surrounded by this great variety of features, it is difficult to establish for the encephaloid tumor any well-marked ground of diagnosis from other tumors growing from bone or periosteum, or appearing to do so by their situation and attachments.

It may in some degree aid the diagnosis of the encephaloid tumor of bone, when situated close to the knee-joint, if the fact be noted, that an encephaloid tumor in this region, will almost certainly have originated either in the condyles of the femur, or in the head of the tibia. To this I know but a single exception, in the instance of an encephaloid tumor filling the ham, and thence advancing upon the sides of the knee; for here the disease appeared to have originated in the cellular tissue of the popliteal space: certainly it had no connexion with the adjacent bones, which were sound*.

The question of amputating a limb, which is the seat of the encephaloid tumor of bone, must chiefly rest on the evidence to be obtained of the probability, or otherwise, of similar disease being reproduced either in the remaining part of the limb or elsewhere. The following facts bear upon this point. A case is recorded by Sir B. Brodie, in which a limb was amputated on account of encephaloid disease originating in the lower part of the femur, and the patient continued in good health at the period the case was related, which was more than four years after the operation†. In a case where I removed the limb, on account of encephaloid disease originating in the head of the tibia, I saw the patient in perfect health at the end of two years from the time of the operation. In several other cases I have had the opportu-

* Museum of the Royal College of Surgeons.

† Diseases of the Joints. Edit. 2. p. 193.

nity of observing patients for shorter periods after amputation, during which there had been no return of the disease; and in four cases of encephaloid disease, originating in the femur, and terminating fatally, I found, on examining the body of each patient, no encephaloid deposit in any other bone or in any of the softer organs. In one of these cases, a child, thirteen years of age, died with an enormous enlargement of the thigh, from encephaloid disease, which had originated in the femur, and not a trace of encephaloid deposit was found in the inguinal absorbent glands, or elsewhere. Every organ in the body was perfectly sound. Under these circumstances I much regretted that the limb was not amputated in an early stage of the disease. The question of an operation had been anxiously considered, but at a period when the disease extended so high up the thigh that it would have been necessary to amputate at the hip-joint, and I could not but apprehend the system was too much enfeebled to sustain the shock of that operation.

But there is evidence of the opposite kind. In a case recorded by Mr. Lawrence, death occurred shortly after the amputation of a limb, on account of encephaloid disease originating in the head of the tibia; and on examining the body, encephaloid deposits were found in the liver, also in the inguinal absorbent glands*. In another recorded case, the arm was amputated on account of encephaloid disease commencing in the humerus. The patient recovered from the operation, but a year afterwards, his health began to decline; his eye protruded from its socket, a tumor appeared upon the cranium, and another in the axilla, and he died fifteen months after the amputation. These tumors were found to consist of encephaloid substance, and there were similar deposits in the lungs and elsewhere†. In the case of a young female, whose thigh I amputated on account of encephaloid disease originating in the lower part of the femur, the stump healed soundly, but she died about six months after the amputation, from encephaloid disease in the lungs.

The frequency with which encephaloid disease in soft parts thus coexists with, or occurs subsequently to, the appearance of this disease in bone, becomes, therefore, an important subject for investigation; and it requires the accurate record of a large series of facts, to determine the degree of confidence with which a limb may be amputated when

* Medico-Chirurgical Transactions, Vol. xvii. p. 42.

† Medical Gazette, April, 1835. Communicated by Mr. Clough, of Manchester.

the seat of encephaloid disease, which commenced in, and is as yet, apparently confined to the bone. It is true that there have been cases in which this disease, originating in bone, was strictly a local malady, and in which, therefore, the removal of it by operation could have been undertaken with the expectation of permanent success. But there have also been cases in which encephaloid disease, apparently commencing in bone, has ultimately presented the same evidence of its being a constitutional and malignant disease, as in the instances of its commencement in any of the softer organs.

In regard to the important question of submitting the encephaloid disease of bone to operation, the following suggestions are offered in accordance with the pathological views generally adopted in respect to other malignant diseases: that the disease is most probably always at first local, and continues so until the circulating fluids and constitution become affected; that from the part in which the disease commences, some of the morbid matter passes into the blood-vessels or absorbents, and poisons the blood, and thus gives rise to the formation of secondary tumors in other parts of the body. If, therefore, the original encephaloid tumor is removed before the blood has become poisoned, the disease will not return; but, if the morbid matters have already entered the circulation, it will be reproduced in other parts of the body. According to these views, the encephaloid tumor of bone should be removed as early as possible; and, of course, before an operation is determined upon, the greatest pains should be taken to ascertain whether the absorbent glands and the internal organs are healthy. Emaciation of the body, with quickness of the pulse, dryness of the skin, and sallowness of the countenance, are indications of the existence of malignant disease in internal organs, and particularly in the absorbent glands. But in some organs, especially in the liver, encephaloid deposits may exist without affording indication of their presence, either by disturbing the functions of the affected organ, or by affecting the general healthy aspect of the body. Such are the difficulties which beset this important subject of the diagnosis of the encephaloid tumor of bone.

4. TUMOR OF BONE COMPOSED CHIEFLY OF FIBROUS TISSUE.

Under this head, it is intended to comprise a large number of the tumors of bone, presenting, on the first view, various features, yet, when closely examined, not manifesting such distinctive characters as

to warrant the distribution of them into separate species. Many of these tumors are composed of a grey, dense, fibrous tissue, apparently identical with that composing the fibrous tumors of the uterus ; whilst others present, at least to the naked eye, no trace of fibres, but are apparently composed of a firm, compact, whitish or yellowish, opaque substance. When, however, a comparative examination is made of some of these apparently different tumors, no real difference between them is recognized; they are found to yield gelatine by boiling, and to agree in their microscopic characters. Nor are there well sustained differences between them in respect either of their vital organization, or in the circumstances of their history. Cartilage not being a clearly-marked element in these tumors, I have abstained from applying to them the term fibro-cartilaginous. Osseous substance, either in minute, isolated portions, or in larger masses, is frequently found intermixed with the softer constituent of these tumors.

To the foregoing general view of these tumors, other particulars of their history are added. They arise indifferently from the outside, or in the interior of bones ; and in the latter case, with the growth of the tumor, the walls of the bone are either absorbed, or expanded around it. Instances have occurred of the growth of such tumors from more than one bone in the same individual ; and there have been instances of their growth to an enormous size. In the museum of St. Bartholomew's Hospital there is part of a fibrous tumor, which grew from the humerus, and measured three feet in its circumference. In some instances, these tumors have exhibited a feature of malignancy in the tendency to reproduction after their removal by operation. In the museum of St. Bartholomew's Hospital there is the portion of a lower jaw, with a fibrous tumor growing from its alveolar border, which was removed by Mr. Lawrence. It was followed by the growth of a similar tumor from the remaining portion of the bone. A large fibrous tumor, which grew from the scapula, was removed in the hospital by Mr. Skey. Another tumor, of the same kind, grew in the same situation, and some months afterwards, the patient died with similar tumors in his chest.

The museum of St. Bartholomew's Hospital contains examples of fibrous tumors growing from the following bones,—lower jaw*, humerus†, femur‡, scapula§. In the museum of the Royal College of

* First series, Nos. 149, 150, &c.
† Thirty-fifth series, No. 10.
‡ First series, No. 22.
§ Thirty-fifth series, No. 51.

Surgeons there are several examples of fibrous tumors growing from the upper and lower jaws. By the liberality of Mr. Luke I am enabled to represent a fibrous tumor originating within the antrum, which, with part of the jaw, was removed by him in the London Hospital*.

It is scarcely possible to establish, during life, any satisfactory diagnosis between the cartilaginous and fibrous tumors of bone, except in the instances where the cartilaginous tumor presents a well-marked noduled exterior: in other respects the features of the fibrous and cartilaginous tumors are the same; both are painless, well-defined in their boundaries, and immediately surrounded by healthy structures; both are of slow growth, and in some instances acquire a large size; and in both there is the same uncertainty respecting the mode of connexion of the tumor with the bone, which would determine the question of removing with the tumor the bone from which it has arisen.

5. TUMOR OF BONE COMPOSED CHIEFLY OF SOFT, GELATINOUS SUBSTANCE.

Under this head I shall describe a tumor of bone originating in the deposition of a soft, gelatinous substance into its cancellous texture. Then, with the progressively increasing morbid deposit, the walls of the bone become absorbed, and a soft, readily compressible, and elastic tumor is formed, which is found to consist of a transparent, semi-fluid, gelatinous substance, contained in cells, bounded by thin, membranous septa. The following is a history of this disease, occurring in the bone of a finger, in a case which was under the care of Mr. Lawrence, in St. Bartholomew's Hospital.

A man, sixty-five years old, had been healthy from birth, and both his parents had been healthy and long-lived. Rather more than a year ago, he noticed a swelling in the first phalanx of the right forefinger: it was moderately firm, gave him little pain, but gradually increased. Six months ago, a lancet was thrust into it, and some blood, with a watery fluid, was discharged, and ulceration of the opening ensued. A seton was afterwards passed through the swelling, and immediately afterwards it rapidly increased. The hand was amputated at the wrist-joint, and in the examination of the diseased parts, the following particulars were observed. The tumor was of a globular form, soft and elastic, and about two inches and a half in diameter. It en-

* Plate 16, fig. 8.

veloped the first, with part of the second phalanx of the fore-finger: its interior consisted of a semi-fluid, jelly-like substance, contained within cells formed by dense, white, fibrous bands. The tumor closely surrounded the bone, which was rough in one situation, while, in another, part of its wall had disappeared. Within the bone, gelatinous substance was deposited, like that of which the tumor consisted. Mr. Paget submitted this substance to microscopic examination, and found that it possessed none of the characters of cartilage, but apparently consisted of a structureless, viscid jelly. In the museum of St. Bartholomew's Hospital there is an example of this tumor growing from a rib*.

It might be supposed that the gelatinous tumor of bone here described is but a softened enchondroma; but looking to the other parts of its history, it appears more analogous to the gelatiniform cancer of other tissues, and this view of it is supported by cases that have occurred, wherein the gelatinous deposits among soft parts were combined with the same deposits in the diploe of the frontal and occipital bones, as well as upon the ribs†.

6. TUMOR OF BONE COMPOSED CHIEFLY OF FATTY SUBSTANCE‡.

Here it is intended to describe a peculiar degeneration of the tissue of bone, accompanied by the formation of a tumor around it. The disease appears to commence in the deposit of a yellow substance into the medullary canals of the bone; hence the colour of the bone is first changed, and then its texture becomes converted into a soft, crumbling, greasy substance. Small cells, filled with a glairy fluid, and short, white, brittle fibres, resembling the hairs of a toothbrush, have been found dispersed through the fatty substance. Osseous granules and laminæ have also been found in it. As the disease advances, the morbid deposit extends beyond the limits of the bone in the form of a circumscribed tumor.

This disease, in its advanced stage, manifests its worst features of malignancy in its tendency to spread indefinitely through the surround-

* First series, No. 115.

† Case of Gelatiniform Cancer, in which nearly all the Organs of the Body contained Colloid Tumors. By John C. Warren, M.D, Medico-Chirurgical Transactions, Vol. xxvii. Cruveilhier. Anatomie Pathologique. Cancer Areolaire des Os. Planche 1, XXI livraison.

‡ The term lardaceous has been applied to this tumor; but the same term has been applied to morbid substances of a different character.

ing structures, with the assimilation of these to its own nature. In an instance of this disease originating in the superior maxillary bone, all the surrounding cellular tissue, and the adjacent absorbent glands, became filled with fatty substance, similar to that of the tumor of the bone. Hard tubercles have formed in the skin covering the tumor; and in the further progress of the disease, ulceration, commencing in the integuments, has extended into the morbid structure, and widely into the parts around it.

The tendency of the disease to spread indefinitely through the parts in its neighbourhood, sufficiently explains the fact, that operations for the removal of this tumor of bone have been generally unsuccessful.

The museum of St. Bartholomew's Hospital contains a specimen of the disease here described, originating in the superior maxillary bone*. It also contains two other specimens, which apparently consist in a similar degeneration of the osseous tissue, but unaccompanied by tumor. In one of these, the disease extends through the os innominatum†; and in the other, it occupies the entire thickness of the shaft of the tibia, in about the extent of its lower third‡.

7. TUMOR OF BONE, COMPOSED OF A SOFT, VERY VASCULAR SUBSTANCE, HAVING THE CHARACTERS OF ERECTILE TISSUE.

This form of tumor is of rare occurrence. In the case of a boy in St. Bartholomew's Hospital, under the care of Mr. Lloyd, the disease originated in the cancellous texture of the lower jaw; and, in its progress, widely separated the walls of the bone, and thence, protruding into the mouth, presented a very vascular surface of a mottled red and purple colour, resembling the exterior of some nævi. The tumor was not tender to the touch, and had not been accompanied by pain; it was once destroyed by caustic to the level of the alveolar border of the jaw, but was quickly reproduced; it was then wholly removed with the portion of the jaw in which it originated, and the cure was permanent. The morbid substance was found imbedded in the cancellous texture of the jaw; it was soft, of a dark red colour, closely resembling the tissue of healthy spleen§. Dupuytren recorded an instance of this disease, also originating in the cancellous texture of the lower jaw in a young person; it projected into the mouth, and was of a deep red colour. A puncture was made in it, from which only blood issued. The

* First series, No. 151. † Ibid. No. 45.

‡ Ibid. No. 78, Plate 4, fig. 4.

§ Museum of St. Bartholomew's Hospital, First series, No. 23, Plate 13, figs. 1, 2.

tumor and the portion of the jaw with which it was connected were removed; and it is stated that the morbid substance closely resembled the tissue of spleen*. Breschet also recorded an instance of this disease originating in the head of the tibia. The interior of the bone had disappeared, and its place was occupied by a morbid growth, resembling the parynchyma of the spleen†. It may perhaps be doubted, whether this was not an example of the simple sanguineous tumor of bone, which is to be next described.

The histories which have been adduced of this erectile tumor of bone, if it may be so designated, are sufficiently clear, in respect to the external characters of the disease, to lead to its recognition, when not concealed by the walls of the bone expanded over it, or by the periosteum, or by other structures investing it. In the case where I had the opportunity of witnessing the examination of the internal structure of the morbid growth, it bore a close resemblance to certain nævi, consisting, like them, apparently of dilated blood-vessels, with a fibrous tissue occupying their inter-spaces; hence, in a section, the tumor presented a cribriform appearance, the orifices being apparently those of divided blood-vessels. The evidence which can be adduced is in favour of removing the portion of bone in which the disease originated, as the security against its reproduction.

8. TUMOR OF BONE, COMPOSED CHIEFLY OF BLOOD.

The tumor here intended to be described consists of blood enclosed in a cyst. The cyst is composed of osseous substance and its periosteum, or in some parts only of the periosteum and surrounding tissues; hence the tumor is, in some instances, firm and resisting throughout; and in others, soft and yielding in portions of its surface. The contents of the cyst are blood, fluid, or coagulated—or fibrin, in solid clots or layers. The inner surface of the cyst often presents a sort of network of fleshy cords, and thus bears some resemblance to the inside of the ventricles of the heart.

This tumor, I believe, always originates in the cancellous texture, generally within the articular end of a bone, and most frequently within the condyles of the femur, or the head of the tibia. The process by which the tumor is formed appears to be this,—blood is effused into the cells of the cancellous texture; as its quantity increases, the cells

* Leçons Orales.

† Répertoire Général d'Anatomie, t. ii. p. 170.

become enlarged, the septa between them absorbed, and at length the walls of the bone become expanded into a globular cyst, of varying thickness and extent. Accordingly, in an early stage of the disease, the blood is found in cells, intersected by fibres and laminæ, the remains of the original fabric of the bone, and, in a more advanced stage, in a single cyst. In instances where, from the feeling of fluctuation, it was thought that suppuration had taken place in the tumor, and an opening was made into it, blood was freely discharged, and an enlargement of the tumor was generally the immediate consequence of such proceeding.

When this disease has been left to itself, ulceration of the skin and other coverings of the cyst has usually taken place, and there has been profuse hæmorrhage from the ulcerated opening.

The cause of the rupture of the medullary vessels, and of the consequent production of the blood-tumor of bone, as it has been aptly designated, appeared, in a case recorded by Mr. Travers, where the disease was seated in the clavicle, to have been external violence applied to the bone*. But in other cases, no such cause has existed. In an instance of this disease originating in the condyles of the femur, in which I amputated the thigh at its middle, an unsoundness of the bone extended from the tumor to the point of amputation; and there was a similar unsound state of the shaft of the tibia, both bones presenting an ecchymosed appearance from minute effusions of blood through their compact tissue†. And in instances where the opportunity has occurred of injecting the arteries of the limb, the fluid has been very freely poured out from a multitude of minute orifices upon the internal surface of the cyst. In the majority of instances, there has been no enlargement or other change in the principal arteries of the limb, or in the vessels immediately connected with the affected bone.

The sanguineous tumor of bone does not usually occur in children, or after the middle period of life; it is, in general, accompanied by severe pain, and is of slow growth. But it must be admitted, that there are no circumstances exclusively belonging to the history of this tumor whereby it can be distinguished from other tumors of bone, or even from other affections of the joint into which the tumor, from its situation, may happen to project.

Instances of this tumor have occurred in the following bones,—the

* Medico-Chirurgical Transactions, Vol. xxi.

† Museum of St. Bartholomew's Hospital, First series, No. 220, Plate 14, fig. 5.

tibia, especially its head; the femur, especially its condyles; the clavicle*, and the scapula†. With respect to the treatment of the disease, it can only admit of the amputation of the limb, or of the excision of the affected bone, as in the case recorded by Mr. Travers, where nearly the whole of the clavicle was successfully removed by operation.

In an instance of sanguineous tumor originating within the condyles of the femur, where I amputated the thigh at its middle, it was considered probable, from the ecchymosed condition of the tibia, and of the femur to its amputated extremity, that other bones had undergone a similar alteration; yet, in the sixth year after the amputation, I ascertained the patient to be in good health, and with a perfectly sound state of the remaining portion of the thigh. In this instance, moreover, whilst the large cyst, formed by the expanded condyles of the femur, was filled by fluid and coagulated blood, there were distinct portions of a soft substance attached to the inside of the cyst, so closely resembling brain-like matter as to suggest that the sanguineous tumor of bone may be a variety, or the incipient stage, of encephaloid disease.

9. TUMOR OF BONE CONSEQUENT ON THE PRODUCTION OF ENTOZOA WITHIN IT.

The globular hydatid, or acephalocyst, has been in a few instances developed within bone; and there is a case recorded, in which the entozoon, Cysticercus cellulosæ, was found within the first phalanx of a fore-finger‡. The production of parasitic animals in bone is accordingly to be regarded among its pathological phenomena; and as the accumulation of them in bone, has been usually followed by expansion of its walls, it has appeared that this subject would be properly considered under the head of the Tumors of Bone.

Globular hydatids have been found in bones of every form. Usually they have been developed only in a single bone; in a case, however, which occurred in St. Bartholomew's Hospital, I found them in two bones—the os innominatum and the sacrum; and in the history of another case, it is stated that the entire osseous system was beset with tumors containing hydatids.§

* Medico-Chirurgical Transactions, Vol. xxi.

† Edinburgh Medical and Surgical Journal, Vol. xvi.

‡ Surgical Clinique of Professor Jünghen:—Man, aged twenty-one, admitted January, 1841, into the Charité of Berlin.

§ Ibid.

The development of hydatids in bone has not, in general, been accompanied by pain or irritation of any kind; but, as the consequence of their increasing number, the following changes have occurred in the bone itself—first, the expansion of its walls, either generally, so as to produce an enlargement of the whole bone, or in a limited extent, so as to produce a well-defined tumor; then absorption of the walls, in one or more situations, has ensued, permitting the escape of the hydatids from the bone into the soft parts around it. The presence of the hydatids in the soft parts contiguous to the bone has excited suppuration, so that, on puncturing the swelling they formed, puriform fluid mixed with the hydatids has been discharged. Further, it has happened that during the absorption of the walls of a bone filled by hydatids, a slight muscular effort caused the bone to snap, and, in such a case, the occurrence of the fracture afforded the first indication of serious mischief in the bone*. Hydatids developed in other organs are contained in adventitious cysts; and there appears to be a similar structure connected with their formation in bone, a smooth white membrane being found closely adherent to the walls of the cavity in the bone in which the hydatids are lodged. The following case furnishes a good illustration of the circumstances connected with the formation of hydatids in bone.

A woman, aged fifty-four, was admitted into St. Bartholomew's Hospital, having a globular and somewhat pendulous tumor, about the size of the closed hand, situated upon the nates, directly over the right sacro-iliac symphisis. She stated it had been five years in progress. A few weeks before her admission, it had been punctured, and purulent fluid mixed with hydatids was discharged. The tumor again enlarged to its original size, and on being punctured a second time, only purulent fluid escaped. A free incision was now made into the tumor, with the effect of discharging a large quantity of hydatids, with fragments of bone and purulent fluid. Severe constitutional derangement ensued, which in a few weeks was fatal.

On examination, numerous globular hydatids were found in the interior of the right os innominatum, and also within the sacrum. In both these bones, the cancellous texture had disappeared, and the surrounding walls were much thinned, and widely separated from each other, a large cavity being thus formed in the bone, in which the hydatids were lodged; there were also apertures in the walls of each bone, through

* Case of Hydatids in the Tibia. By W. J. Wickham, Esq. London Medical and Physical Journal, Vol. lvii.

which, some of the hydatids had escaped into the surrounding soft parts. The cavity in the sacrum communicated also with the spinal canal, in which there were numerous hydatids. A smooth white membrane lined the cavity in the os innominatum and sacrum. There was a mass of hydatids between the extensor muscles of the spine, which was unconnected with the contiguous bones, and another mass in a cyst attached to the ovary. On examining the acephalocysts found in the bones, by the aid of the microscope, the enchinococcus was discovered in some of them, a fact proving the identity of this hydatid in bone with that found in the human liver, urinary bladder, subcutaneous cellular tissue, and other organs—for in the acephalocyst hydatids from these several parts, echinococci have been recognized*.

The foregoing case shows the uncertainty there may be in the diagnosis of the tumor produced by hydatids, which have escaped from the bone where they were formed, into the parts around it. The hydatid cyst, protruding from a bone, forms a soft elastic swelling, which has been mistaken for the tumor of malignant disease; and when, by the absorption of their membranous cyst, the hydatids have escaped into the surrounding cellular tissue, exciting suppuration in it, the swelling has presented the characters of chronic abscess. When, owing to the increasing accumulation of hydatids in a bone, its walls become thinned and expanded, the tumor may then communicate to the fingers the peculiar crackling sensation which belongs generally to osseous cysts with thin sides. But, in some instances, the walls of a bone filled with hydatids do not become thinned; they simply expand in such a manner as to form a circumscribed, unyielding tumor, having the characters of an osseous growth from the bone. Such was the nature of the tumor, and consequently the difficulty of its diagnosis, in the remarkable case recorded by Mr. Keate†, of "an enormous collection of hydatids between the two tables of the frontal bone." The tumor projected from the forehead, chiefly over the left orbit, and presented "the shape and size of three-fourths of a large orange." Mr. Keate states, that "the tumor was evidently of bony growth; and that the immediate impression on his mind was, that it was between the two tables of the frontal bone, the external table being pushed forward, causing the convex surface of the protuberance, and the internal table to be depressed, giving rise to the present urgent symptoms," which were intense head-

* Medico-Chirurgical Transactions, Vol. xxiii, and Vol. xxviii. Müller, Archiv für Physiol. 1836. Medical Gazette, Vol. xxxv.

† Medico-Chirurgical Transactions, Vol. x.

aches, vertigo, dimness of sight, nausea, tinnitus aurium. The removal of the tumor was undertaken, when it was discovered to be a collection of hydatids in a cavity circumscribed by the tables of the frontal bone, and lined by a thin, transparent membrane. The outer table of the skull was taken away, sufficiently for the full exposure of the cavity containing the hydatids, which were completely removed. Lint, impregnated with a strong solution of sulphate of copper, and also nitrate of silver, was applied to the denuded surfaces of the bone, with the view of preventing the reproduction of the hydatids, and with good effect. Healthy granulations arose from the inner table of the skull, which cicatrized; the wound healed soundly, and the patient was restored to perfect health.

The treatment suited to a case of hydatids in bone will depend on the situation and extent of the disease. If the hydatids occupy the larger portion of a bone, and have occasioned much destruction of its walls, the removal of the entire bone, or of the limb in which the disease is situated, may be necessary. But there are cases in which it is expedient to scoop out the hydatids from the cavity in the bone; and in treating such cases, it should be borne in mind, that the bone is not diseased otherwise than as its walls are expanded, or in part absorbed, consequently that no more of the bone will require removal than is sufficient to effect the dislodgement of the hydatids from their cells; for when this has been done, and astringents or stimulants have afterwards been applied to the bone, no reproduction of the hydatids has ensued. Healthy granulations have filled the cavity in the bone, and the wound has healed soundly over them. Such was the satisfactory result of the treatment of the case of hydatids in the frontal bone recorded by Mr. Keate.

Another case is recorded, in which the hydatid tumor of bone was treated successfully. The tumor, three inches in circumference, projected full two inches from the front of the tibia; its centre was soft, but around its base a bony margin could be felt, indicating that the disease originated within the bone, and had caused the destruction of its walls. Applications were made to the tumor, consisting, first of caustic potash, afterwards of the actual cautery, by which a cavity in the tibia, three inches long and two inches and a half wide, was exposed, filled with hydatids. The hydatids were removed, and, after several exfoliations, the cavity in the bone became filled with healthy granulations, which cicatrized, with the power and movements of the

limb unimpaired*. Also, in the case already referred to, where the first indication of disease in the tibia was the occurrence of its fracture without apparent cause, four inches of the front wall of the bone were removed, exposing its interior, containing a tea-cup-full of hydatids. The hydatids were taken away, leaving only a thin shell of the bone for about two inches of its length. The wound granulated and healed rapidly, and the cure was completed without weakening or shortening of the limb†.

10. TUMOR OF BONE, CONSEQUENT ON THE FORMATION OF MEMBRANOUS CYSTS WITHIN IT.

Membranous cysts are developed in bone, containing a serous or mucilaginous fluid, occasionally mixed with shining particles of a spermaceti-like substance. The enlargement of such cysts may be accompanied by a partial or general expansion of the walls of the bone. These cysts are frequently developed in the upper, also in the lower, jaw; and they have been stated to exist in other bones, but it is doubtful whether the disease so described was any other than the circumscribed abscess, which is, I believe, in all instances lined by a membranous cyst. Since the development of the simple membranous cyst, containing a serous or mucilaginous fluid, probably occurs only in the maxillary bones, the history of this disease is given under the head of morbid growths from the jaws.

GENERAL CONSIDERATIONS RELATIVE TO THE DIAGNOSIS AND PROGRESS OF THE TUMORS OF BONE.

I am induced to add further observations on the diagnosis and progress of the tumors of bone, in the desire that this confessedly difficult, yet most important, subject may here receive all the aid of which it is capable.

In the foregoing histories of the morbid growths from bone, the occasional combination of different products and structures, in the same tumor, has been noticed, as giving rise to difficulties in their diagnosis. It has been shown, that some of these tumors participate in the characters of the morbid growths from soft parts, in respect to changes to which they are liable; and besides, in respect to changes in their

* Journal de Médecine, Chirurgie, &c., par M. Corvisart, tome xii. Observation sur une tumeur du tibia, qui contenait une grande quantité d'hydatis, par M. Cullerier.

† Case by Mr. Wickham, London Medical and Physical Journal, Vol. lvii.

composition. Thus, to the original constituent of the tumor, a different deposit appears, in some instances, to have been added; and it is probable that, in such cases, the change is generally, if not always, from innocent to malignant disease, and not in the reverse direction. In the following case, the addition of malignant to innocent disease in a tumor of bone appeared well marked. A man had, for many years, a tumor of his clavicle, which presented externally no other features than those of simple exostosis. At length he died from encephaloid deposits in various organs; and, on making a section of the tumor of the clavicle, it was found to consist of cancellous osseous tissue, with encephaloid matter filling its cells.

Our objects in practice are, first, to recognize the broad distinctions between the innocent and malignant tumors of bone; and, secondly, to be able to decide upon the connexions of the tumor, in addition to its nature, as influencing the question of removing the tumor alone, or with it, part, or the whole, of the bone from which it has grown. The following summary of facts bearing on these conclusions, may perhaps be of use—premising that any details they embrace not included in the histories already related, are drawn from other cases which have occurred within my personal observation, unless otherwise stated.

Of the Tumors composed of soft substance, but so firm as to be incompressible. These tumors are mostly fibrous or cartilaginous; but they are occasionally found to consist of the firmer sort of encephaloid substance.

Of the Tumors which have the hardness and solidity of bone. If such a tumor has an even regular outline, is of an oval shape, with its long diameter in the axis of the bone—and if besides, in its whole extent, it closely surrounds the bone—the probability is considerable that it will prove to be the malignant osseous tumor (Osteoid, of Müller). There has, however, been an instance of a tumor possessing such characters, yet proving to be an osseous cyst, with thick solid walls, and containing encephaloid substance. If the tumor which possesses the hardness and solidity of bone, is of irregular form, and noduled or branched on its exterior, its characters are those of the innocent osseous tumor (exostosis). The tumor of enchondroma may be noduled on its exterior; but it is just so much less hard and solid than exostosis, that it may yield a little to compression.

Of the Tumors which are so soft as to be readily compressible. Most of the compressible tumors of bone are encephaloid in one or

other of its forms, and consequently malignant. There are, however, exceptions, in the instances of tumors composed of soft vascular, in some cases apparently an erectile tissue, exhibiting none of the characters of malignant disease.

Of the degree of fixedness of the Tumor, as evidence of the sort of connexion it has with the bone. The absolute immobility of the tumor is no ground for determining whether it has grown from the periosteum, or from the surface of the bone, or from its interior. A tumor which has a broad extent of growth in the cellular tissue, immediately adjacent to the periosteum, is often as firmly fixed in its position, and therefore may be as immovable, as the tumor which has originated within the bone. The looseness and mobility of a tumor lying upon a bone may lead to a wrong conclusion respecting the mode of its origin. An encephaloid tumor, which had originated within a rib, and extended through the walls of the bone, and thence through the pectoral muscle, was felt immediately beneath the skin, and was so freely movable, that the removal of it by operation was proposed, in the belief it was wholly subcutaneous. Such an error in the diagnosis has arisen in the following way. The morbid growth originating within the bone, having penetrated a small aperture in its walls, then spread widely over its surface. The tumor, being thus connected with the interior of the bone by only a narrow stalk or pedicle, was so loose and movable, that its origin within the bone was not suspected.

Of the Enlargement and Tortuosity of the Subcutaneous Veins ramifying over the Tumor. This condition of the veins is not, as it has often been regarded, evidence of malignancy in the tumor of bone; it occurs upon simple inflammatory and rapidly-forming swellings, wholly unconnected with malignant disease. The cause of the enlargement and tortuosity of the superficial veins, in all instances, is probably an obstruction to the current of blood through the principal and deep veins of the part.

Condition of the Absorbent Glands adjacent to the Tumor. The absence of enlargement or other change in these glands, is not a sure sign of the innocent character of the disease. Occasionally, even in the advanced stage of encephaloid disease originating in the femur, the femoral and inguinal absorbent glands are not either enlarged or altered in structure.

Anomalous character imparted to the Tumor by the flow of Blood into it from an Ulcerated Artery. Tumors of bone commonly occasion the obliteration of the arteries they meet in their progress; but in

some instances it is otherwise. A tumor growing from a bone has occasioned the ulceration of a large artery with which it became implicated; hæmorrhage then taking place into the tumor, has caused its sudden enlargement, and has, besides, given to it an anomalous character, greatly obscuring its diagnosis. The following is the history of such a case.

A man was admitted into St. Bartholomew's Hospital, who stated that, from his earliest recollection, he had a hard swelling at the upper and outer part of his leg; that, about five months previous to his admission, he had several attacks of cramp in his leg, soon after which, a swelling rapidly formed, accompanied by a sense of heat in the calf. The swelling gradually extended from the knee to the ancle; and it became so large, that in its middle part, its circumference measured twenty inches: it was soft and elastic, and the skin covering it was o a reddish-purple hue. Various opinions were formed of the nature of the disease; and, on the ground of its uncertainty, the limb was amputated. On examining it, a large quantity of blood, fluid and coagulated, was found between the soleus and deep muscles of the leg, the source of which was ascertained to be an ulcerated hole in the anterior tibial artery, at the point of its passage between the tibia and fibula, to the front of the leg. The artery at the part where it had given way, was immediately surrounded by a mass of fine osseous fibres mixed with encephaloid substance, which had grown from the fibula.

Displacement of Blood-vessels by the Tumor. In the examination of morbid growths originating in the lower part of the femur, I have found the popliteal artery and vein displaced, and separated from each other, to an extent that, from their natural very firm connexion, would scarcely be expected. In one case, the popliteal vessels were found upon the inner side of an osseous tumor, which had grown from the back part of the femur. In another instance, the popliteal vessels were displaced to the outer side of an encephaloid tumor growing from the femur; and the artery was separated from the vein to the extent of three inches. The following is the history of this case, containing other particulars of interest, which was furnished to me by Mr. Lawrence, surgeon to the Sussex County Hospital.

A female, aged thirty-seven, was admitted into the Sussex Hospital, with a large swelling occupying the entire circumference of the knee-joint; it was soft and elastic, and the veins ramifying over it were very large and tortuous. The thigh was amputated about five inches from the hip-joint. The femoral vein, at the part where it was divided, was

enormously dilated, the valves being, in consequence, ineffective: directly the vein was divided, a current of blood rushed from its orifice with so much force, that it extended full three feet from the limb. This large and unexpected hæmorrhage so nearly extinguished life, that it was deemed necessary to resort to the transfusion of blood, which was done with complete success. Five weeks after the operation, the patient left the hospital perfectly well. The condyles and adjacent part of the shaft of the femur were found in part expanded around the tumor, which consisted of encephaloid substance mixed with osseous fibres.

TUMORS OF BONE WHICH PULSATE.

A remarkable feature, namely, pulsation, is occasionally observed in the tumors of bone. There may be either a slight thrill or vibration through portions of the tumor, or the deep, heavy pulsation of aneurism in every part of it. In certain cases, the structure of the tumor has been such as apparently to account for its pulsation, but in others there has been no other apparent cause of pulsation than the contiguity of the tumor to a large artery.

The pulsating tumors of bone are various in their nature, more especially those tumors which owe their pulsation to an artery lying in contact with them. Most of this class of pulsating tumors consist of encephaloid substance, originating either in the head, or lower end of the tibia, or in the condyles of the femur, or in the head of the humerus. In a few cases, the pulsating tumor has consisted only of blood enclosed in an osseous cyst, without morbid change in the adjacent blood-vessels, or the development of any vascular and erectile tissue; these were instances of the sanguineous tumor of bone deriving pulsation from the large artery contiguous to it. In one case which I examined, the pulsating tumor, originating in the humerus, consisted of a gelatinous substance, forming the thick walls of a large cavity, filled by a serous fluid: this, probably, was a cartilaginous tumor, which had undergone the central softening and disorganizing process, which occurs in such tumors*.

The further considerations on the pulsating tumors of bone will be arranged under the following heads. 1. The sources of their pulsation. 2. The diagnosis between these tumors and aneurism. 3. The treatment.

* Museum of St. Bartholomew's Hospital, First series, No. 86.

Three distinct sources of pulsation have been recognized in these tumors. 1. The proximity of a large artery. 2. The development of blood-vessels and blood-cells, constituting a sort of erectile tissue within the tumor. 3. The enlargement of the arteries of the bone.

1. There have been, at different periods, in St. Bartholomew's Hospital, three instances of pulsating tumor, two originating in the upper part of the humerus, and the third in the lower part of the femur, in each of which, the tumor was considered to be aneurism, until, in the examination of the parts, it was discovered that the only source of pulsation was the large artery which, in each case, lay in close proximity to the tumor. To these cases, three others may be added; one of encephaloid pulsating tumor, originating in the head of the tibia, recorded by Mr. Lawrence*, and two of encephaloid pulsating tumors, originating in the lower part of the tibia, communicated to me by Mr. Hodgson. These cases presented, on examination, no other source of pulsation than the proximity of the tumors to the popliteal artery in the first case, and to the arteries of the leg in the two others. The following case evidently belongs to the same category. A man, aged sixty eight, suffered two severe falls upon the shoulder. Subsequently an enlargement of the part ensued, with pulsation in it. The tumor was considered to be an aneurism, and the subclavian artery was tied. Three weeks after the operation the patient sank. The tumor was found to be a mass of medullary substance, to which the axillary artery firmly adhered, the vessel itself being perfectly sound†.

2. In a case of pulsating tumor, originating in the ilium, and projecting from both surfaces of the bone, which occurred in St. Bartholomew's Hospital, the tumor, upon examination was found to be soft and spongy, having small cells dispersed through it, filled with blood. Bunches of convoluted vessels could be drawn out of this spongy substance, and the whole tumor, when macerated, was reduced to a tissue, closely resembling that of unravelled spleen, or placenta‡. Here was a structure capable of enlargement by the distension of its vessels and cells; and it is highly probable that the rush of blood from the surrounding arteries into this structure produced the pulsation, which gave to the tumor so completely the characters of aneurism. At all events,

* Medico-Chirurgical Transactions, Vol. xvii.

† Case of medullary sarcoma engaging the upper portion of the humerus considered aneurismal, and for which the subclavian artery was tied above the clavicle, by John Nichol, M.D. Edinburgh Medical and Surgical Journal, July, 1834.

‡ Museum of St. Bartholomew's Hospital, First series, Nos. 235—238.

it is certain that the tumor instantly ceased to pulsate when the aorta was compressed through the walls of the abdomen; moreover, that it enlarged, and became tense, when the femoral artery below it was compressed, just as an aneurism under similar circumstances would have done. Through the liberality of Mr. John Lawrence, surgeon to the Sussex County Hospital, I had the opportunity of examining a pulsating tumor, which originated in the upper part of the femur. This tumor was of the size of the head of a full-grown fœtus, and composed of vessels intermixed with a soft, gelatinous substance. The vessels formed more than half the bulk of the tumor: they were of the size of sewing thread, and very convoluted, and were shown by injection to be directly continuous with the arterial system. In this instance, therefore, the structure of the tumor, essentially the same as in the case before described, was such as might be considered to account for its pulsation.

3. In some few cases which have been recorded, the pulsating tumor of bone was accompanied by an enlargement of the arteries distributed through the osseous tissue, to which, therefore, the pulsation might be ascribed. Such cases are related by Scarpa* and by Dupuytren†. There are cases, also, related by Pelletan‡, in which the pulsating tumor appeared to have originated in enlargement and rupture of the special nutrient artery of the medullary tissue of the bone; and in an instance related by Morgagni§, the foramen in the walls of the femur transmitting this artery, had enlarged to the extent that it easily admitted the little finger. A case, apparently of the same character as the foregoing, occurred to Mr. Luke, of the London Hospital, in which a pulsating tumor originated in the shaft of the femur, at the part where the bone had been twice broken. The opinion being entertained that the tumor was aneurismal, the femoral artery was tied, and the tumor became somewhat diminished. About a month afterwards, it again enlarged, and the limb was then amputated. The lower third of the femur was found expanded into a spherical tumor, in the interior of which were cells of various size, filled with blood. The femoral artery and vein were entire and healthy. The medullary artery of the femur was greatly enlarged, and, in the amputation, more than forty arteries required the ligature. In this case, however, it

* Treatise on Aneurism. Translated by Wishart, p. 439, et seq.

† Leçons Orales, t. iv. p. 60.

‡ Clinique Chirurgicale, t. ii., Obs. iv., v.

§ On Diseases, Book iv., Let. ii., Art. 38, 39.

may be a question, whether the general enlargement of the arteries of the thigh accompanied the formation of the pulsating tumor, or had taken place subsequently, as a consequence of the ligature upon the femoral artery.

Whatever may be the source of pulsation in the tumor of bone, its strength and its distinctness are, in every case, materially influenced by the degree of density and power of resistance possessed by the structures immediately investing the tumor. It may, indeed, be doubted, whether any of these tumors would pulsate independently of the firm support afforded by the bone, or its immediate coverings. This point is well illustrated in the history of a medullary tumor developed in the head of the tibia, recorded by Mr. Lawrence, where the tumor pulsated in its early stage, but ceased to pulsate directly it had burst through the resistant coverings of the bone*.

The character of the pulsation in the tumor of bone has been, in many instances, so perfectly identical with the pulsation of aneurism, that the most experienced surgeons have been deceived by it. Thus the compression of the arterial trunk leading to the tumor has produced, with the stoppage of pulsation, a lessening in the size and tension of the tumor, whilst the compression of the artery below the tumor, has been followed by increase of its tension and size: further, the compression of the tumor has caused it, in some degree, to recede; and on slowly remitting the pressure, the sensation has been communicated to the fingers of a rush of blood into the tumor. Such certainly have been the characters of the pulsating tumor of bone, and they are the ordinary characters of aneurism.

In the next place it is to be observed, that the bruit, or bellows' sound, which, under many circumstances, is a distinctive character of aneurism, belongs alike, and with equal force, to the pulsating tumor of bone. In the case of pulsating tumor of the ilium, which occurred in St. Bartholomew's Hospital, the ear resting against the tumor recognized the strongly-marked bellows' sound of aneurism; and in the case of encephaloid tumor of the pelvis, which has been recorded by Mr. Guthrie, it is stated, "that on putting the ear to the tumor, the whizzing sound attendant on the flow of blood into aneurism could be very distinctly heard†." The bruit or bellows' sound has been recognized, not only in the cases where it could be ascribed to the flow of blood

* Medico-Chirurgical Transactions, Vol. xvii.

† London Medical and Surgical Journal, August, 1834.

through the vessels and cells within the tumor, but also in others, where the tumor possessed no such structure, and where, consequently, the sound recognized in it must have been derived from the pulsations of the large artery immediately contiguous to the tumor. There are facts which show that a tumor of any sort, situated close to a large artery, may so influence the character of its pulsations, that the ear resting against the tumor will recognize in it the distinct bruit, or bellows' sound: hence we may refer to this source the aneurismal sound heard in certain pulsating tumors of bone situated close to large arteries, but possessing nothing in their internal structure which would adequately explain the pulsation.

With respect to the treatment of the pulsating tumors of bone, there can be but one material consideration, namely, whether the main artery leading to the tumor should be tied, in the expectation that, if the chief current of blood flowing to the tumor be stopped, it will cease to grow, and gradually disappear. Here the difficulty lies in the diagnosis between the two classes of pulsating tumors of bone—those which do, and those which do not, possess an internal structure adequate to produce their pulsation. In a case of encephaloid tumor deriving its pulsation from the large artery contiguous to it, the ligature of the artery above the tumor would be of no avail; but a different view would be taken of the probable effect of the ligature of the main artery leading to a tumor, composed chiefly of blood-vessels, or blood-cells, arranged in the form of erectile tissue, or otherwise. In instances of such a form of disease, the ligature of the main artery of the limb has been followed by the gradual disappearance of the tumor, but not always by the permanent cure of it; for in some of these cases, the tumor re-appeared at a distant period from the operation. On the important question of the results of treatment, the following evidence is recorded:—

Pulsating Tumor just below the Knee. A man, aged forty-three, was attacked with a sharp and fixed pain in the knee. Soon afterwards, a pulsating tumor was recognized just below the joint. The disease advanced very gradually during the next two years, and at the end of that time, presented the following characters:—The head of the tibia was enlarged to twice its natural size, and every where pulsated, and with each pulsation there appeared to be an expansion of the tumor. Compression of it was accompanied by a peculiar crackling sensation; and at one point, an aperture in its osseous parietes was recognized. M. Lallemand tied the femoral artery in the upper third of the thigh.

the operation was followed by a gradual subsidence of the disease, and the return of the bone to its natural condition. Three months after the operation, the patient was able to walk without crutches. No mention is made of any recurrence of the disease*.

Pulsating Tumor just below the Knee. In a man, aged thirty-two, a pulsating tumor appeared at the inner side of the tibia, just below the knee. In a year from its commencement, the circumference of the tumor was about equal to that of the palm of the hand. Dupuytren tied the femoral artery in the middle of the thigh. The pulsations of the tumor directly ceased, but, a few days afterwards, they returned in a slight degree. The pulsations again ceased, and the tumor gradually disappeared. Seven years afterwards, the tumor re-appeared, and acquired a large size, but was without pulsation. Dupuytren then amputated the limb; the wound bled so profusely, that twenty-four vessels required the ligature. The patient recovered. On examining the amputated limb, the tumor was found to be composed of numerous cysts; some filled with a gelatinous matter, others with coagulated blood. A fine membrane lined the cysts, through which vessels were abundantly distributed in the form of a close network†.

Pulsating Tumor just above the Wrist. A pulsating tumor originated in the lower part of the radius of a man, aged thirty-six years. M. Roux tied the brachial artery in the middle of the arm; the tumor became flaccid, ceased to pulsate, and underwent no further change for five weeks; it then again increased with the return of pulsation. M. Roux amputated the arm. The radius, through its lower fourth, had disappeared; the pulsating tumor which occupied its place, was composed of cells filled with blood.

Pulsating Tumor just below the Knee. In a man, aged forty-five years, the head of the tibia was enlarged, and presented from its outer side, a distinct projection as large as the closed hand. When the tumor had existed for several months, pulsation in it was discovered, but the impulse was unaccompanied by bruit de soufflet. M. Roux tied the femoral artery; the tumor collapsed, ceased to beat, and gradually decreased, the head of the tibia recovering its natural form and size‡.

* Observations sur un tumeur aneurismale accompagnée de circonstances insolités par M. Lallemand, Répertoire général d'Anatomie et de Physiologie, tome ii.

† Leçons Orales, tome iv. p. 60.

‡ Bulletin de l'Academie Royale de Médecine, séance du Février, 1845. Faits et remarques sur les tumeurs fongueuses sanguines ou aneurismales des os, par M. Roux.

The foregoing cases furnish sufficient evidence to prove that the pulsating tumor of bone, which is composed of blood alone, or of blood contained in the vessels and cells of an erectile tissue, may be arrested in its progress by the ligature of the main artery of the limb. Moreover, it deserves attention, that the ligature of the artery was, in two of these cases, followed by reparative processes in the bone, effecting the restoration of its natural size and firmness.

In a case of pulsating tumor of bone, which, from its situation, and other circumstances, might be favourable for the ligature of the main artery of the limb, difficulties in the diagnosis are likely to arise—first, in ascertaining that the tumor is not aneurism, and, secondly, in deciding it to be a form of pulsating tumor which is curable by operation. In the case of pulsating tumor of the ilium, which occurred in St. Bartholomew's Hospital*, after the most careful consideration of its circumstances, a ligature was placed around the common iliac artery, in the belief that the tumor was an aneurism. There was, indeed, in this case, one circumstance from which doubt did arise, as to the tumor being aneurismal; namely, the existence of a small movable piece of bone, involved in the coverings of the tumor, this being an ordinary feature of the tumor of diseased bone, but not of aneurism.

Further illustration of the difficulty in the diagnosis between the tumor of aneurism and of diseased bone is afforded in the following case. A soldier, aged nineteen, while walking, suddenly felt pain in his left ham, and immediately afterwards a swelling in the ham began, which in twenty-four hours increased to the size of a goose's egg, and distinctly pulsated. The femoral artery was tied, but without arresting the progress of the tumor; it continued to increase, and the patient sank. The tumor was found to be situated deeply in the ham, and was closely adherent to the periosteum of the femur and of the tibia. In its exterior portion, there were cysts containing a sanguineous fluid; its interior consisted in part of fibrous tissue disposed in lobes, and in part of a softer substance, containing cells filled with serous fluid. The internal structure of the femur and of the tibia was healthy. The popliteal artery was healthy; it ran over the tumor between the sacs of fluid on its surface, through which, it appeared, the pulsation of the artery was communicated to the whole mass of the tumor. The right lung was filled by brain-like substance. The disease here described, in the mode of its commencement, and in its characters, presented so

* Medico-Chirurgical Transactions, Vol. xxviii.

completely the features of popliteal aneurism, that, in the belief of its being so, the femoral artery was tied. The case is accordingly described as an instance of "fibrous tumor, mistaken for an aneurism*."

No observations of much value can be offered in aid of the diagnosis between the several forms of pulsating tumor arising in bone, with the view of distinguishing those which are curable by operation. The encephaloid tumor may be soft and readily yielding to compression, or resilient; and so has been the tumor composed of a sort of erectile tissue, unaccompanied by any peculiar morbid deposit. Nor can assistance in the diagnosis be gained by attention to the nature of the coverings of the tumor, whether these be soft and readily yielding, or firm and resisting, or but moderately firm, and yielding with crepitation, the latter circumstance depending on the presence of a thin osseous cyst enclosing the soft contents of the tumor. But the osseous cyst may be thick and unyielding; it is, besides, found in different cases to enclose various fluid or solid morbid products, and accordingly it affords no information respecting the internal constitution of the tumor.

Instances have occurred of pulsating tumors arising from more than one bone in the same individual. One such case is recorded by Scarpa. On account of a pulsating tumor originating in the tibia, the limb was amputated above the knee. Five years afterwards, the end of the stump enlarged and pulsated. The man died from exhaustion; and, on examining the remaining portion of the amputated thigh, it was found "full of bloody polypous clots, similar to those in an aneurism. The substance of the os femoris had been absorbed from the apex of the stump to the vicinity of the great trochanter, the periosteum of all this portion of the thigh-bone was thickened, interspersed with blood-vessels very much dilated, and converted into a sheath which supplied the place of an aneurismal sac†." The following is a remarkable instance of pulsating tumors originating in many bones. An old man, in the course of two years, had seven pulsating tumors developed in different parts of the skeleton. He died comatose. The body was examined, in the presence of Scarpa, by Dr. Borta. The arterial system having been injected from the aorta, the tumors were then examined. Each tumor was invested by the periosteum, which was thick, spongy, and very vascular. Beneath it, was a reddish-yellow mass,

* Observations in Pathology, by Dr. Kerst: Utrecht, 1839.

† Treatise on Aneurism. Transl. by Wishart, p. 439.

soft in some parts, elastic in others, traversed by a net-work of capillaries. All the tumors presented the same structure*. A case, still more remarkable, is recorded by Cruveilhier, in which numerous tumors formed in various parts of the body, all strongly pulsating, and presenting, besides, a distinct bruit de soufflet. Upon examination, some of these tumors were found to have originated in the bones; but there were others wholly unconnected with them. All the tumors presented the same structure, being composed of cells of various size, divided by fibrous threads, and filled with blood†.

OSSEOUS GROWTHS, ARISING, IN CONSIDERABLE NUMBERS, FROM THE SKELETON, AND IN THE SOFT TISSUES.

This section will comprise certain cases of rare occurrence, wherein osseous growths, apparently of constitutional origin, have arisen indifferently from the bones and in the soft tissues; and so remarkable, in such instances, has been the tendency to the production of these growths, that they have appeared in various situations and in considerable number, either simultaneously or in quick succession; sometimes as the direct consequence of local excitement, but as frequently without it. Some of these osseous growths, when arising from the skeleton, have possessed the cartilaginous base, and primordial structure of genuine exostoses; whilst, in other instances, the osseous growths from the skeleton, and alike from the soft tissues, have appeared to possess no cartilaginous base or matrix, but have resembled the outgrowths or circumscribed hypertrophies of bone.

Most of these cases have occurred in early life; it was then, at least, that the production of the numerous osseous growths commenced; and they have continued to increase in size during the growth of the body to its full stature, but not afterwards.

Some of these cases have occurred in several individuals of the same family; and occasionally in a direction to show an hereditary tendency to the disease. A man in St. Bartholomew's Hospital had a large os-

* Scarpa; Annali Universali di Med. 1830, translated into the Archives Générales de Médicine, tome xxiii. et xxiv.

† Anatomie Pathologique, fol., livraison xxxiii. Toutes les tumeurs pulsatiles étaient constituées par un tissu caverneux. dont les aréoles fibreusec, très inégales pour la capacité, étaient remplies de sang. Plusieurs de ces tumeurs, la tumeur du genou, la tumeur de l'épaule gauche, sont étrangères aux os, développées dans l'épaisseur et aux dépens des parties molles. La tumeur costale, les tumeurs de l'épaule droite, et les tumeurs crâniennes sont formées aux dépens du tissu osseux.

seous growth from one femur, and several smaller growths of the same kind from the other femur; also, similar growths from both tibiæ, and from the bones of the fingers of both hands. All the tumors had formed in early life, and were now stationary. He stated, that his father had bony swellings in various parts of the body; and I saw two of his children, in whom there were osseous growths from the humerus, radius, and ulna, and from the ribs.

The following is also an instance of the hereditary character of this disease.

A boy, six years of age, was in St. Bartholomew's Hospital, under the care of Mr. Lloyd. He had numerous osseous growths from the bones of the fingers—from each radius, humerus, scapula, tibia, fibula, and from the ribs. Most of the growths were symmetrical, in situation and form; and all those on the right side of the body were rather larger than those on the left. The father of this boy came to the hospital. He had several osseous growths, one on each parietal bone, one on each humerus, one or the first phalanx of the right forefinger, one on each femur, just above the inner condyle, and one on the inner side of the head of each tibia. This man stated, that neither his father nor mother, nor (so far as he knew) their parents, had such tumors; but that four of his cousins on the mother's side had them. Of his own four children, the one in the hospital was alone thus affected.

By request of the parents, Mr. Lloyd removed the fore-finger of the boy in the hospital, on account of the inconvenience he suffered from the distortion of it, occasioned by the osseous growth from its first phalanx. The tumor was found to consist of cancellous osseous substance, with wide cells full of soft medulla, and coated by a thin layer of compact osseous substance. The cancellous tissue of the tumor was continuous with that of the bone of the finger.

Another circumstance in the history of these cases is, that whilst in some of them, during the tendency to osseous deposits on the skeleton and elsewhere, the urine was deficient in its usual proportion of phosphate of lime; in others it was not so—the urine was found to be healthy, and there was no sign of other derangement in the system, to which the occurrence of the disease could be ascribed.

It must be conceded, that, respecting the pathology of this disease, no satisfactory knowledge exists. Whatever information can be furnished respecting it, either in respect to the pathology, or to curative measures, will, I believe, be found in the following histories.

Mr. Abernethy has recorded the following case:—"A youth, about

fourteen years of age, was brought to me, whose back was greatly deformed by hillocks of earthy matter, heaped up upon the spinous processes of the vertebræ. The ligamentum nuchæ was ossified, so that the head was immovably fixed. There were exostoses on the os brachii of both arms, and the tendinous margins of the axillæ were converted into bone, and pinioned his arms so closely to his sides, that it was difficult to insinuate the fold of a napkin between them and the chest. There was an exostosis on the pelvis, and various others had formed at different times, and disappeared. If, in a forcible effort to accomplish any purpose which his manacled situation often obliged him to make, he accidentally struck his head or any projection of bone, a temporary deposition of earthy matter was always the result. He had had the toothache, and an exostosis appeared on the lower jaw."

The urine of this patient was examined by Sir Humphry Davy, and found to be deficient in the usual proportion of phosphate of lime, and accordingly, Mr. Abernethy directed the patient to take phosphoric acid in the proportion of one drachm daily, dissolved in such a quantity of water as it would slightly acidulate. Whilst he took this medicine, the urine resembled that of other persons, containing the usual proportion of lime, with a surplus of phosphoric acid. On discontinuing it, the urine directly altered—it contained neither lime nor phosphoric acid in the right proportion*.

A girl, fourteen years of age, was admitted into St. Bartholomew's Hospital, under the care of Mr. Earle, on account of an osseous growth from the upper and inner part of the humerus. She was apparently in good health, and, as the growth was increasing, its removal by operation was proposed; but other similar growths were discovered upon the thigh bones, and upon the tibiæ, of the existence of which the girl was not aware. The idea of an operation was now abandoned. A generous diet was allowed, and five grains of blue pill were directed to be taken every night.

An analysis of the patient's urine was made by Dr. Bostock, who reported to me the following results—that before the mercury was administered, it was of low specific gravity, was deficient in the proportion of phosphate of lime, and contained a considerable quantity of albumen; that after the mercury had been continued some days, and before salivation was produced, the urine contained the ordinary quantity of phosphate of lime, and was in other respects healthy; and that after

* Lectures on Surgery, by John Abernethy, p. 169.

the discontinuance of the mercury, the urine again became deficient in phosphate of lime, and in other respects unhealthy as before.

Mr. Hawkins has recorded the case of a man, twenty-two years of age, in whom a multitude of osseous deposits were formed in various parts of the body, many of them independently of the skeleton. His general health was good; the only organ in which any derangement of function could be discovered was the skin; its surface was morbidly greasy, but there was no deficiency in the perspiration. One of the osseous tumors was removed by operation; its earthy components were carbonate and phosphate of lime: it had cancelli and an outer shell, periosteum, and cartilage; and its microscopic characters were the same as those of true bone. Under the administration of iodide of potassium and sarsaparilla, and under the constitutional action of mercury, many of the tumors disappeared. Diluted sulphuric acid was given to this patient, and, during its use, all the tumors which were then forming considerably decreased in size*.

The case of a man, whose skeleton is preserved in the museum of the Royal College of Surgeons, was apparently of the same class as the foregoing. Numerous osseous growths have arisen from various bones, also in the course of the muscles—some of them projecting into the joints, which became in consequence anchylosed. It is remarkable, moreover, that in this skeleton, the bones are unusually light, containing less than the ordinary proportion of earthy matter, which, notwithstanding, is so abundantly deposited elsewhere.

* Medical Gazette, May 31, 1844.

PART III.

CHAPTER I.

RICKETS.

It would appear, from some of the recorded histories of rickets, that the condition of the osseous system implied by this term is, in certain cases, accompanied by fever, continuing to the destruction of life. But it is not ordinarily so. The morbid changes in the bones are, in general, accompanied by a state of simple weakness through the rest of the system. This is the chief constitutional feature of the disease. And yet the changes in the bones, from the state of health to that of rickets, are not such as it might be expected would result from a mere deficiency of their earthy matter, in the view that a certain amount of vigor of system is requisite for the separation of the salts of bone, giving to it its proper hardness. But the rickety bone is not simply a soft bone; it undergoes, during the development and subsidence of the disease, a series of curious and somewhat complex changes.

Rickets has been observed in the fœtus. In the museum of St. Bartholomew's Hospital, there is a fœtal skeleton, exhibiting a rickety condition of the bones, accompanied by enlargement of the skull, from hydrocephalus. In some instances, rickets has commenced immediately after birth; it rarely, however, appears before the fifth or sixth month, and the most frequent period of its commencement is between eighteen and twenty-four months. It very seldom commences after puberty.

The first indication of rickets in a bone, is a diminution of its firmness, from the separation of its lamellæ and fibres, accompanied by an altered character of its medulla. Its tube, cells, and the interstices

of its lamellæ, and fibres, become filled by a serous fluid; at a later stage, this fluid is replaced by a gelatinous substance, which becomes organized, and passes into the condition of a moderately firm, elastic tissue, with minute cells dispersed through it. Accordingly, at this period, the bone consists throughout of a sort of cartilaginous tissue, which will bend without breaking, and through which a knife may be readily passed. Within this tissue, distinct roundish pieces of a blueish semitransparent substance are occasionally observed; these are apparently some remains of the original fœtal cartilage. Hitherto it has been supposed, that the change in the rickety bone consists simply in the reduction of it to its cartilaginous elements, and that accordingly, its chemical condition is the same as that of bone from which the earthy matters have been abstracted by an acid; but, in the recent analysis of a rickety bone, it is shown, that besides the diminution of its earthy salts, there is also a change in the animal matter, so that the extract obtained from it by boiling does not yield either chondrin, or the gelatine of bone*.

The epiphyses are united to the shafts in rickety bones less firmly than in healthy bones. Occasionally, the articular ends of rickety bones are expanded; but this occurs only in the joints possessing a thin covering of soft parts, such as the wrist, elbow, knee, and ancle. In a case which has been recorded, expansion of the ends of the bones occurred to a remarkable extent, without any distortion of their shafts†.

The following are the principal changes which occur from rickets, in the separate bones, and in the several portions of the skeleton.

The figure of the bones is changed in various directions, determined by the weight and pressure they have to sustain, as well as by the action of the muscles which surround them. Long bones become twisted or bent; some of these, especially the tibia and fibula, are occasionally bent into angles, but more frequently into curves. Flat bones become hypertrophied in their cancellous texture, and curved. Irregulary-shaped bones expand in certain directions, whereby their form is changed.

* Beiträge zur Physiologischen und Pathologischen Chemie und Mikroscopie, v. Dr. F. Simon, Berlin, 1843. The changes in the bones from rickets are well described by Guerin, in his Mémoire sur les charactères généraux du rachitisme, Paris, 1839.

† Case by Thomas Brayne, Esq., Banbury. Transactions of the Provincial Association, Vol. iii., with a representation of the figure of the child, at the age of seven years.

In the rickety child, the head is below the standard dimensions, from the arrest of its growth; but this is more marked in the bones of the face, than in those of the cranium; hence, in such individuals, the cranium appears large in proportion to the face. "When," Mr. Shaw remarks, "we observe the shape of the head in such deformed persons, it will be perceived that one general character belongs to them; that whilst the cranium appears unusually large, and capacious, the face is remarkably small*." The flat bones of the cranium become thick, porous, and spongy—and their outer surface often presents a peculiar roughness, resembling the texture of woollen cloth.

The spine suffers changes in its figures, from the yielding of its weakened fibro-cartilages and ligaments. It becomes curved and twisted, and its curvatures are either lateral, or in the antero-posterior direction. A single curve occurs in a portion of the spine, or extends through the whole of it; or there are two, or three curves, occupying the entire spine. In the curvatures of considerable extent, the bend, or twist of the spine, is not in general entirely in one direction; thus the extensive lateral curves are usually combined with some degree of yielding of the spine in the antero-posterior direction.

Changes in the form of the bodies and processes of the vertebræ ensue in consequence of these distortions; the bodies lose much of their thickness, on their front or lateral aspects, according to the direction of the curvature, from the undue pressure which they suffer on the concave side of the curve; and, on the convex side of the curve, the articular processes become much augmented in breadth and thickness, obviously with the effect of adding materially to the strength of the distorted portion of the spine.

The curvatures of the spine ensuing from rickets, do not exhibit characteristic features, distinguishing them from the curvatures which arise under various other circumstances. And, with respect to the consideration of their causes, the whole of these distortions apparently constitute but one series; the causes of distortion being either weakness in one or other of the structures, whose office it is to maintain the spine erect, or irregular action of the muscles on one side of the spine, interfering with the balanced actions of the muscles on its opposite sides, which concur to the maintenance of its erect figure.

* On the effects of rickets upon the growth of the skull, by Alexander Shaw, Esq., Medico-Chirurgical Transactions, Vol. xxvi.

What are the circumstances which determine the localization of the weakness of structure and function, and the consequent distortion in one or other limited district of the spine, is probably but inadequately explained. Weakness of constitution, whether connected with rickets or not, is, in most cases, the source to which we look for explanation of distortions of the spine; but it might rather be expected, that such a generally acting cause would determine an equal yielding through the whole length of the spine. Such an exception to the general rule did occur in the following case. In a female, sixteen years of age, of feeble health and slim person, a single lateral curve, of considerable depth, with its convexity to the right, and including the whole length of the spine, had formed in the course of a few weeks. That the yielding of the spine was owing to the weakness of the structures which should firmly bind together its component pieces, was evident by the effect of such moderate extension of the column as could be made by gently elevating the head and shoulders, for then the curvature wholly disappeared. An apparatus was applied, for the object of keeping the vertebræ in their proper place; and when this had been continuously worn for nine months, it was removed without the recurrence of the distortion; and, besides, it was ascertained that the stature of the body now exceeded by two inches that which it was ascertained to be at the time of the first application of the apparatus. The increase may have been in part owing to growth, but it must have been chiefly owing to the straightening of the distorted spine.

There are, however, considerations which guide the diagnosis between the curvatures of the spine induced by rickets, and by other causes. The curvatures from rickets are rare among the children of the affluent. They occur equally in both sexes, whilst the curvatures from other causes are most frequent in females. Also, the curvatures from rickets occur at an earlier period of life than the curvatures otherwise induced, which appear usually in females, between the ages of ten and sixteen years. In these cases, moreover, the distortion is confined to the spine and ribs; and is not, therefore, accompanied or followed by the distortion and defective growth in the pelvis and lower limbs, which are the characteristics of rickets. For the first notice of these important distinctions, we are indebted to Mr. A. Shaw, of the Middlesex Hospital, and to his late brother, Mr. John Shaw*.

* On the Conformation of the Skeleton in Rickets, by Alexander Shaw, Esq. Medico-Chirurgical Transactions, Vol. xvii.

Distortion in the form of the chest is a consequence of the curvature of the spine, and the distortion is often increased by the yielding of the softened ribs to the action of the muscles which are attached to them. The sides of the chest are, in most instances, flattened, and the sternum is thrust forwards; but the softened ribs yield in various directions, and the form of the chest varies in different cases, in correspondence with the varieties in the curvature of the spine.

The pelvis is small from the interruption of its growth, and remarkable changes occur in its form, from the yielding of its bones and ligaments. The pressure which the heads of the thigh bones make through the acetabula, upon the front wall of the pelvis, is constantly tending to approximate it to the posterior wall, and besides to give the front wall the flattened form, which is characteristic of the rickety pelvis. The hollowness of the loins, which, also, is a character of rickets, is a consequence of changes in the position of the sacrum, produced by the weight of the spine and parts around, the head and upper limbs, constantly bearing downwards upon the sacrum. The base of the sacrum is in consequence apparently thrust downwards and forwards, whereby its promontory is rendered unnaturally prominent, and its posterior surface forms the bottom of a hollow in the back part of the pelvis. But it is not to be understood, that in the rickety pelvis, the sacrum is thrust forwards in front of the ilia. The following are apparently the changes which here ensue. The yielding of the sacro-iliac symphyses permits a sort of movement of the sacrum in such a direction as make its promontory project forwards and its apex project backwards; and, at the same time, the iliac bones are forced backwards in a direction to overlap the sacrum, and to approximate towards each other, in some instances to such a degree, that not more than the space of an inch has intervened between their posterior borders.

The following observations, communicated to me by Dr. A. Farre, complete the view of the changes which occur in the pelvis from rickets. "It is a circumstance of not infrequent occurrence, where the antero-posterior diameter of the brim of the pelvis is diminished by an unnatural approximation of the promontory of the sacrum to the symphysis pubis, that the corresponding diameter of the outlet remains unaffected, or is even increased, partly by the tilting backwards of the other extremity of the sacrum, and partly by an unusual straightening of the bone, by which the hollow of the sacrum is nearly obliterated. Of this, there is a very good example in the museum of King's Col-

lege. The conjugate diameter of the brim, in this case, measures only two inches, in consequence of the falling in of the promontory of the sacrum; while the corresponding diameter of the outlet measures exactly the double of this; the sacrum being, at the same time, so straight, that the hollow does not measure quite half an inch at its deepest point. In these cases, the bending appears to take place chiefly in the iliac bones, which permit the sacrum to fall forwards. They form a striking contrast with those pelves, in which, the sacrum being much softened, becomes bent upon itself, the coccyx approaching the promontory, and the hollow of the sacrum being increased to a depth, in some instances, of two inches, while the antero-posterior diameter, both at the brim and outlet, are equally reduced."

The necks of the thigh bones, yielding to the superincumbent weight, lose their obliquity; they gradually approach to a horizontal direction; and the dropping of the heads and necks of the thigh bones, in some instances, takes place in such a degree, that the heads of the bones become situated below the summits of the great trochanters.

Arrest of growth is a prominent character of rickety long bones; they are of small dimensions; this however is, in general, most marked in the lower limbs: hence, the short stature of such persons, independently of incurvations of their bones. In long bones, the defective growth in length is often such that they are not more than half their natural dimensions; but in the direction of their thickness, it is not so constant: thus thigh-bones, a third, or even a fourth, shorter than natural, are often of their natural thickness. Occasionally, other phenomena are observed in the rickety skeleton; some of its bones are distorted, whilst others are of their natural figure and length, but, from the failure of growth in the direction of their thickness, are so slender as to present the characters of extreme atrophy.

In the lower limbs, the weakness of system, which gives rise to curvatures in the bones, also occasions a yielding of the ligaments of the knee and ancle-joints; hence the distortions of these joints, from the yielding of their ligaments become part of the phenomena of rickets. And there are instances of such distortions of the knee and ancle-joints, unaccompanied by any bending of the bones.

It had long ago been observed, that deformity of the spine from rickets is generally accompanied by curvatures of the thigh bones.

And to this circumstance reference has been made, in illustration of a supposed law, determining the progressive ascent of the rickety changes in the bones, from the lower to the higher parts of the skeleton; accordingly, that the deformity of one part implies the deformity of the parts below it. Such, certainly, is the ordinary progress of rickets, but there are exceptions to it. In the museum of King's College, there is an adult skeleton, exhibiting distortion of the spine, and of the upper and lower limbs, but none of the pelvis; and in another adult female skeleton, which I examined, there was extreme distortion of the spine, and of the lower limbs, with but the slightest change in the figure of the pelvis*. Again, in opposition to any supposed law, regulating the progressive changes of the bones in rickets, the instances may be noticed, in which only a single bone becomes distorted. A man, forty years of age, was admitted into St. Bartholomew's Hospital on account of disease in his urinary organs: his whole body was small, almost of dwarf-like size, and in the bones of both fore-arms, there had been such an interruption of growth, that each fore-arm was scarcely half its proper length in relation to the upper arm. But only a single bone had undergone any change in its figure; this was the left tibia, which was considerably curved.

There are observations which show, that the reason why the distortion from rickets first, and mostly, appears in the bones of the lower limbs is, that these bones are, more than any others, exercised in their functions, as organs of support and locomotion, at the age in which rickets usually commences; consequently, that when softened by rickets, they first yield to the weight of the body, and to the action of the muscles which surround them. Upon this subject, Dr. A. Farre has communicated to me the following remarks:—"With regard to the effects of rickets upon the upper extremities, I have seen these bent in cases where the lower extremities, and, indeed, the rest of the body generally, exhibited no signs of the disease." Having related the particulars of two such cases, Dr. Farre observes:—"These two cases of rickety curvature in the upper extremities, when the lower remain unaffected, may be adduced to controvert the doctrine that rickets is a

* In the museum of St. Bartholomew's Hospital there are ten specimens of curved spines preserved with the pelves. In six of these, the pelvis is distorted, in the other four, it is unaltered. In the same museum, there are three specimens of curved spines preserved with the pelves and lower limbs. In all these, the pelvis and limbs are distorted; in two of them, the distortion of the pelvis is considerable; in the third, it is trifling, but the limbs are, in this instance, greatly distorted.

disease, which always commences in the lower extremities, and proceeds upwards. I rather look upon the deformities produced by rickets, as dependent in all cases upon mechanical causes, operating upon unhealthy osseous structures. And I explain the circumstance of the usual development of the disease in the lower extremities first, by reference to the fact, that these have to sustain the weight of the body, and, consequently, yield, and become curved, before the upper extremities exhibit any signs of their being affected by the softening process. Thus, it will be observed, that the cases which I have described, of rickety curvature affecting the upper extremities only, are cases of infants at the breast, who had not yet begun to use the lower extremities, and, consequently in whom, there had been no application of pressure to these parts, the deformity being shown, in these cases, in those extremities only, which, in infants of that age, are the most employed, namely, the arms. In these cases, the deformity is still, I imagine, produced by a mechanical cause, namely, by muscular contraction. It is well known, that the power of grasp in the hand of an infant is often very considerable; the muscles employed for this purpose being those which lie on the inner side of the fore-arm. Now these being employed in infants more constantly perhaps than any other set of muscles, in their restless efforts to seize all objects within their reach, will, if the bones are soft, give a tendency to curvature in that direction in which traction is most frequently employed." In a third case, which Dr. Farre communicated to me, he had the opportunity of observing the curvatures taking place, first in the fore-arms, and afterwards in the legs; the bones in this instance, from their softened condition, yielding to attacks of convulsion, which first affected chiefly the upper half of the body, and subsequently the lower, when the legs became bent.

Perfect reparation of rickety bones would imply the recovery of their natural form and texture; and this does, under favourable circumstances, take place. In most instances, however, of considerable distortion, the bones regain hardness of texture, but remain curved or twisted, and of proportionately small dimensions.

The rickety bone recovers its hardness by the approximation and consolidation of its lamellæ, but the interspaces of its cancelli remain wider than in healthy bone. A remarkable feature in the reparative process, is the deposit of so large a proportion of earthy matter in the soft bone, as to give it a hardness and weight much beyond that of

healthy bone; in some instances almost equal to that of ivory. Thus the hardness of the repaired rickety bone may compensate for the curvature of it, so unfavourable to the support of the weight it has to sustain. Other circumstances of interest arise in this process; they are, the obliquity of the lamellæ and fibres within the curved and hardened bone, also the greater thickness of its walls on the concave, than on the convex, side of its curvature; and, besides, the remarkable prolongation of the linea aspera of the femur, both in its breadth and thickness. These arrangements are certainly calculated to give strength to the bent bone in the direction where it is especially wanted, and it is difficult to avoid the conclusion that this is their special purpose*.

Long bones, especially the tibia and fibula, when bent into an angular form, rarely regain their natural figure; and the medullary tube becomes obliterated at the angle, so that the bone here consists only of compact tissue. The tibia and fibula, besides the curvature, occasionally become flattened, and of greatly increased width. Other peculiarities occur in repaired rickety long bones; their shape is, in some instances, irregular, especially near their articular ends; and there are often osseous growths from them of the character of exostoses.

Flat bones, affected by rickets, become, in the progress of reparation, hard, compact, and heavy, and, in some instances, of greatly increased thickness.

Short bones, of various figures, affected by rickets, become, in the progress of reparation, irregular on their outer surface, and hard in texture.

Among the usually assigned causes of rickets, impure air and defective nutriment are probably the most influential; and in this view, the production of rickets might appear to be due to the operation of the same causes upon the animal system, as the production of tubercle in the lung, and elsewhere; yet the existence of such an alliance between these maladies, is not indicated by frequent simultaneous occurrence in the same individual. In the examination of the bodies of twenty rickety children, tubercle in the lung was found in only six; and it appeared that tubercle occurs less frequently in children who have died from rickets, than in those who have died from other dis-

* Medico-Chirurgical Transactions, Vol. vii. Illustrations of the Condition of the Bones in Rickets and of the Mode of their Reparation, Plate 20.

eases*; nor is rickets commonly accompanied by enlargement of the superficial absorbent glands, or other outward marks of scrofula. Rokitansky observes to the same effect, that rachitis and tubercle are very rarely associated; that, particularly in the instances of rachitic malformation, with contraction of the chest, tubercle is scarcely ever found to exist. It does not appear, moreover, that in those who have recovered from rickets, the duration of life is shortened. In the museum of the University of Boon, I saw the skeleton of a man who died at the age of seventy-seven, in which the long bones are curved and expanded at their extremities, and the flat bones are thickened. And in the same museum there is the skeleton of a female who died at the age of ninety-four, the bones in which are curved from rickets.

TREATMENT OF RICKETS.

Here it is deemed sufficient to state the principal indications of treatment arising from the consideration of the changes which the bones and joints suffer in rickets.

In conjunction with general measures directed to the strengthening of the system, such local measures are to be directed to the weak and distorted structures as will add to the vigor of the circulation in them, and thereby improve their nutrition. Frictions of the part tend to this result; but exercise of the muscles is the more decided means of its accomplishment. Free action of the muscles around the rickety bone is quickly, and with certainty, followed by increase of its strength, and this is no more than might be expected from the principle manifested throughout the animal kingdom, in the correspondence of the hardness of the bones with the energy of the muscles which clothe them.

Increase of the distortion in the bones or joints is to be prevented; and efforts are to be made for the removal of the existing distortion and deformity. For these objects, mechanical contrivances are available, with the best results. If, for instance, by the yielding of the ligaments of the knee, or ancle, distortion of the joint has ensued, an apparatus is sought for, which will direct the joint to its right position, and maintain it so, whilst the weakened ligaments are recovering their tone. Much good is to be accomplished by moderate, but continuous

* Recherches sur le rachitisme chez des enfans, par M. Rufz. Encyclographie des Sciences Médicales, Mars, 1834.

pressure directed against a bent bone, or distorted joint, for the object of regaining its right form and position.

The employ of mechanical contrivances is clearly indicated, when the exercise of the part cannot be permitted without increase in the curvatures of the bones, or in the distortion of the joints which have yielded from the weakness of their ligaments. Without such aid, the rickety bone may recover its firmness, but it will retain its deformity; and the ligaments of the distorted joint may recover their tone, but it will be with no lessening of the distortion.

One condition essential to the proper use of all mechanical apparatus, wherever applied, is, that neither by its weight, nor by the mode of its application, should it restrict the free action of the muscles of the part which is the seat of the distortion. In other words, the apparatus must be so constructed and applied, that it can be worn without hindrance to the natural movements of the part. And, besides, it is desirable, for the full effect of mechanical contrivances, that their action should be continuous, not remitting. Directly the restraint they impose is withdrawn, or even lessened, the muscles, aided by the contractility of the other tissues surrounding the distorted bone or joint, will begin to reproduce the distortion. And this evil tendency will continue long after the apparently perfect restoration of the part to its right form and position.

There is, however, a limit to the capability of restoration in the rickety bone, or distorted joint. Although it be true, that the bone which is bent, and even in a great degree from the softness of its texture, can be made to regain its natural figure; yet, when the altered form of a bone is such as to imply something beyond mere mechanical agency, it is to be expected that the distortion will be permanent—such, for example, as the thinning of the bodies of the vertebræ, from the pressure they have suffered, or, from the same cause, the altered form of the articular ends of the bones of a distorted joint, for these changes are the result of a vital action in the part; and there is no evidence to prove that a bone thus altered, can be remodelled into its natural form and proportions. Accordingly, the curvatures of the rickety spine will be permanent, when accompanied by thinning of the bodies of the vertebræ; and the distortion of a joint will be permanent, when accompanied by change in the configuration of its bones.

CHAPTER II.

CONDITIONS OF BONE DESIGNATED MOLLITIES, AND FRAGILITAS OSSIUM*.

These terms are applied to certain conditions of bone, characterized by either a softening or brittleness of its tissue; but it is doubtful whether they are actually distinct diseases. The pathology of these affections is indeed so little understood, that in treating of them, I purpose merely to arrange the cases which they include conveniently for reference and illustration.

In this series of cases, the walls of the bones become thinned, and, in some instances, softened; their medullary tubes and cells are found filled with fatty matter, not materially differing in its characters from healthy medulla. Such being one of the conditions of the osseous system belonging to advanced age, it becomes a question, whether some of the recorded examples of mollities and fragilitas ossium were not instances of the simple atrophy of the bones, occurring in old persons. There have, however, been cases in which similar changes in the osseous system occurred in the middle period of life, accompanied by peculiar constitutional symptoms, and terminating fatally. The following is the history of such a disease.

In a female, twenty-five years of age, the first symptom of disorder was a sense of weariness, succeeded by severe pains in the limbs. The pains were referred to the bones, and gradually increasing in severity, she died worn out by suffering, eighteen months after the commencement of the malady. Four days before death, whilst turning in bed, the left femur broke in its middle third. All the bones were found of

* The terms osteo-malacia and malacosteon, have also been applied to these affections of bone.

their natural form and size, but very light, and by the slightest effort, any of them could be broken. The periosteum could be separated from every bone with unusual facility. The surface of each bone was of a deep red colour, and its texture was so soft, that it could be readily penetrated by a scalpel. The walls of the long bones were reduced to the thinness of a line, with enlargement of their medullary tubes and cells, which were filled with a very thick, deep red medullary substance. The medullary membrane was thickened*.

Other cases, similar to the foregoing, are recorded, and they have occurred chiefly in females. The morbid changes in the bones were in general preceded by severe pains in them, which were supposed to be rheumatic, and were accompanied by extreme debility of the system. In some instances, there was hæmorrhage from the gums, with other symptoms of scurvy†. After the continuance of the pains in the bones, and the constitutional derangement for some time, the nature of the disease has in general been made evident by the bending of one or more of the bones upon some slight effort. In one case, during the progress of the disease, a white sediment was deposited from the urine, which, upon evaporation, became, it is stated, like mortar‡. In a second instance, this sediment was ascertained to be the earthy matter of the bones§. In the history of another case, it is stated, that abundance of chalky matter was found in the urine‖. And in a case recorded by Mr. Solly, the urine contained between three and four times the amount of phosphate of lime that belongs to it in health¶. There is, however, one other case recorded, in which nothing different from health could be discovered in either the perspiration or the urine**.

In most of these cases, the disease attacked the whole skeleton; in a few, only the spine and pelvis; and in some, only a single bone. In nearly all the cases where the contents of the widened medullary tube and cells were carefully examined, they were found to consist only of adipose matter, which, by long maceration, could be converted into adipocire. In the museum of Dr. Hunter, at Glasgow, I saw

* Observation de maladie générale des os, par M. Robertz. Encyclographie des Sciences Médicales, Août, 1834.

† Case by Sir John Pringle, Philosophical Transactions, Vol. xlviii.

‡ Case by Mr. Thompson, Medical Observations and Enquiries, Vol. v.

§ Case by Mr. Bromfield, Chirurgical Observations, Vol. ii.

‖ Case by Dr. Hosty, Philosophical Transactions, Vol. xlviii.

¶ Medico-Chirurgical Transactions, Vol. xxvii.

** London Medical Journal, Vol. vi.

several of the bones which were obtained from the case recorded by Mr. Thompson. Their walls and cancellous texture had wholly disappeared; their periosteum was much thickened, and enclosed a yellow adipose substance. In a case described by Mr. Hunter*, and of which specimens are in the museum of the College of Surgeons, he says, the bone "resembled a species of fatty tumor, giving the appearance of a spongy bone, deprived of its earth and soaked in soft fat."

In a portion of the femur, recently examined by Mr. Paget, from a case of softening of the bones, which was under the observation of Mr. Tamplin, the medullary tube and cells were filled with a substance presenting the appearance of variously coloured jelly; yet it contained a large quantity of fluid oil, not lodged in fat cells, but held in its place by the remnants of the medullary membrane. The osseous tissue itself contained a præternaturally large quantity of oily matter. In a case recorded by Mr. Howship, the walls of the long bones had wholly disappeared, and the contents of the periosteal tube are stated to have been "a red pulpy or fleshy matter, in some parts resembling liver—in others, grumous blood†." But portions of the bones from this case, preserved in the museum of the College of Surgeons, show that a large part, or nearly the whole, of this peculiar substance consisted of fat.

Dr. Bostock furnished me the following analysis of a portion of the femur, from the case recorded by Mr. Curling‡: "On the first inspection, it appeared to be composed of an homogeneous mass of adipose matter, enclosed in a thin bony shell. The adipose matter was of a light brown colour, and had the appearance and constitution of butter. Upon a more minute examination, the interior of the bone was found to consist of a very delicate cellular texture, the cavities of which were filled with a fluid oil, which was so abundant as to give to the whole the homogeneous appearance described above. A piece of the bone was placed on an inclined plane of glass, and a considerable quantity of a fluid spontaneously oozed from it, which had the consis-

* Observations on the case by Mr. Goodwin, in the London Medical Journal, Vol. vi.

† Transactions of the Medico-Chirurgical Society of Edinburgh, Vol. ii.

‡ Museum of St. Bartholomew's Hospital, First series, Nos. 129, 130. Specimens of the bones from the case described by Mr. Curling, Medico-Chirurgical Transactions, Vol. xx. One of these is the section of a femur, the walls of which are very thin and soft, and the widened medullary tube is filled by a yellow adipose substance, resembling lard. Another is the section of a humerus, in which the adipose substance, by long maceration in water, has become firm, and of a white colour, resembling adipocire.

tence, physical properties, and general appearance of spermaceti oil. The constitution of the entire bone was, 100 parts—of oil, about 67; of membrane, about 20; of earthy salts, about 11. The composition of the earthy salts was, in 100 parts—phosphate of lime, 90; carbonate of lime, about 8; sulphate of lime, about 2. The obvious peculiarity of this bone, was the very large quantity of oil it contained, amounting probably to three-fourths or more of its whole weight, and the corresponding small quantity of membranous basis and earthy salts. The appearance of the bone, both after the oil had drained off, and after calcination, indicated rather a mere deficiency of the solid parts, than any thing that resembled disease."

Sufficient evidence has been adduced to prove the occurrence of a peculiar constitutional affection, accompanied by softening of the bones, with thinning of their walls, and with the accumulation of adipose matter in their tubes and cells. This disease, occurring in the middle period of life, has in general terminated fatally in one or two years, and, in most of its instances, it presented the remarkable feature of a præternatural excretion of phosphate of lime with the urine.

The softened tissue of the bones, in the cases which have been considered to constitute the disease designated mollities ossium, is followed by the distortion of them. It is unnecessary to describe the particular directions in which the bones yield, for, indeed, they bend in all directions likely to be determined by the muscles acting on them, and by the weight they sustain. Between the distortions from mollities ossium, and from rickets, there is just this difference, that the former occur after the growth of the bones is completed, whilst the latter occur in early life; hence the dwarfish size, from the arrest of growth, in the bent rickety bones; hence, also, the unnatural shapes into which they become modelled. The distinctive features of mollities ossium and of rickets are strongly marked in the pelvis. A chief character of the pelvis, altered by mollities ossium, is the pushing inwards of its sides by the pressure of the heads of the thigh bones against the acetabula, which is so remarkably contrasted with the flattening of the front wall in the rickety pelvis. It has been well observed, that if, in mollities ossium, the various doublings of the distorted pelvis could be unfolded, it would be restored to its natural form and proportions; not so with respect to the rickety pelvis, where, with the yielding of the bones and ligaments, the parts are of dwarfish size, and of undue shapes and proportions, from the unnatural modelling they have undergone during the growth of the body.

Various cases have been included in the series comprised under the head of fragilitas ossium, which certainly do not belong to it; as, for example, the carcinomatous and encephaloid deposits in bones, accompanied by the removal of their inner laminæ and cancellous texture. There are, however, instances of the simple thinning of the walls of bones, unaccompanied by morbid deposit in their interior, or by softening of their texture. In some of these, rheumatism, and in others, syphilis, preceded the manifestation of disease in the bones, by the occurrence of fracture in one or more of them. Also, in the advanced stages of carcinoma, especially in the breast, thinning of the walls of the long bones, and fractures of them from apparently slight causes, are especially observed. In many instances, a fixed pain in the bone has preceded its fracture. In some cases, only a single bone has been fractured; but in others, there have been fractures of several bones occurring in quick succession. In a case recorded by Mr. Tyrrell, there had been as many as twenty-two fractures, scarcely a long bone having escaped*; and in another case, recorded by Mr. Arnott, there had been thirty-one fractures†.

It is remarkable, that the fractures which occur in these cases, are generally accompanied by very little pain, and are followed by scarcely any inflammation in the part; it is still more remarkable, that notwithstanding the unsoundness of the bone preceding its fracture, the union of it should take place in the ordinary period, and occasionally within it. I have seen many instances in proof of this statement. The following is one of them. In a female, aged thirty, whilst she was raising a light chair, the humerus broke in its middle. During the preceding year, she had been under treatment for secondary syphilis, and, for several months, had suffered severe pain in the part of the bone where the fracture now occurred. As the bone was supposed to be unsound, it was presumed the reparation of the fracture would be tedious, perhaps wholly fail—but it proved otherwise. At the end of a month, the union of the fracture was moderately firm; in five weeks it was perfectly so. Mr. Tyrrell observes, in reference to the case he related, that "in the man who had had so many fractures, the accidents were repaired with greater rapidity than I have seen in other individuals, the union of the fracture of the femur being perfectly firm at the expiration of three or four weeks." In a female, aged fourteen, under the care of Mr. Arnott, in Middlesex Hospital, the first fracture

* St. Thomas's Hospital Reports, No. 1.
† Medical Gazette, June, 1833.

occurred at the age of three years; altogether there were thirty-one fractures in different bones, and in some of them the fracture was many times repeated. Many of the fractures occurred from the slightest effort, and there was no difficulty in obtaining their union. In a sister of this patient, six years of age, there was the same condition of the bones, favouring the occurrence of fractures. She had suffered nine fractures since the age of eight months. A case, similar to the foregoing, was under the care of Mr. Earle, in St. Bartholomew's Hospital. A boy, aged ten years, had suffered eight fractures, six in one tibia, and two in the femur. Each fracture of the tibia occurred in a different part of the bone, and had united within the usual period.

In one of the cases just related, the disposition of the bones to break from very slight causes, was manifested in two members of the same family. In other instances there has been a still more decided hereditary tendency to such an affection of the osseous system. Dr. Pauli, of Leipzig, states, that he is acquainted with a family, in which individuals, belonging to three generations, have suffered from extraordinary fragility of the bones*.

The following cases will illustrate the various circumstances attendant on this condition of the osseous system.

Fractures of the Humerus and Femora, following Rheumatism. The following case was communicated to me by Mr. Wilson, surgeon to the Manchester Infirmary. A female, twenty-four years of age, was admitted into the Infirmary, in the supposition that she was suffering from rheumatism. As she was being carried up the staircase, the shaft of her left femur broke, and it was ascertained that nine months previously, she had suffered a fracture of the left arm, in catching hold of a balustrade; this fracture had united, and the union of the fracture of the femur was also in progress, when, as the patient was being raised in bed, she felt a severe pain in the opposite thigh, and exclaimed that the bone had broken, which was found to be true. From this period, her health rapidly declined; she complained of aching in her bones, and of general weariness, with failure of appetite. Every effort was made to sustain the vital powers, but without effect; she died about four months after her admission into the Infirmary. A portion of the recently fractured femur exhibits a thinning of its walls, from the absorption of its inner laminæ, but without softening of its texture —it retains the hardness of healthy bone†.

* Untersuchungen und Erfahrungen im Gebiete der Chirurgie.

† Museum of St. Bartholomew's Hospital, First series, No. 128.

Several Fractures in the Bones of the Lower Limbs, of which no union could be obtained. A female, aged twenty-six, was admitted into St. Bartholomew's Hospital, with a fracture in the upper part of the shaft of the left femur. She stated, that she had suffered rheumatism in this limb, and that, three days previously, the fracture occurred as she was crossing a road. She was placed on her back, with a straight splint on the outside of the limb. When she had been in the hospital about two months, whilst lying perfectly quiet in bed, she suddenly cried out that she felt a severe pain in the other thigh, and that the bone had broken; the house surgeon, happening to be in the ward, found the right femur fractured in its centre. At subsequent, and distant periods, whilst confined in bed, a second fracture of the left femur occurred, a little above the knee, and fractures of both tibiæ, immediately below their tuberosities. She remained in the hospital above two years, during which, every effort was made to obtain the union of the fractures. Throughout, her general health was unimpaired, the appetite good, bowels regular, and the urine perfectly natural. The most generous diet and tonic medicines were freely administered. Having found in a German journal, an account of cases of ununited fracture successfully treated, by giving to the patients lime and phosphoric acid, I administered, in this case, these medicines, in the following proportions—first, fifteen minims of the dilute acid in an ounce of lime-water, afterwards thirty minims of the acid in an ounce and a half of lime-water every six hours, and this treatment was continued for three months, but without benefit. At the expiration of two years, from the occurrence of the first fracture, the patient left the hospital, both lower limbs being powerless, and when moved, severely painful. None of the fractures had united, and both limbs were shortened to the extent of several inches, with considerable distortion.

Thinning of the Walls of all the Bones of a Lower Limb, in a young person, unaccompanied by constitutional derangement. A boy, fifteen years of age, was admitted into St. Bartholomew's Hospital, under the care of Mr. Lawrence, on account of disease in his knee-joint. The disease had existed for fifteen months, and its symptoms were those of inflammation in the synovial membrane, leading to the destruction of the articular cartilages. Four years and a quarter before the disease of the knee began, he had been laid up for thirteen months, with disease of the ancle in the same limb. But he apparently quite recovered from this affection, and he thought his right (dis-

eased) limb was as large and as strong as the other, until the affection of the knee commenced.

In the amputation of the limb, a single stroke of the saw cut through half the femur, and the remainder broke, the bone was so small and its walls so thin. All the other tissues of the limb appeared healthy.

The knee-joint exhibited the ordinary changes of structure, from inflammation of the synovial membrane and ulceration of the cartilages. The femur, and the bones of the leg and foot, were of small size, their walls were extremely thin, and their cells filled with adipose matter.

The wound of the operation healed soundly, and within the usual period.

The foregoing histories prove the occurrence of cases wherein there is a simple thinning of the walls of a single bone, or of many bones, unconnected with other morbid change, accompanied, in some instances, by derangement of the health—in others, not so—occasionally appearing as a symptom of secondary syphilis, and often arising as a consequence of the peculiar state of the system, attendant on the advanced stages of carcinoma. Still, however, it is not clear, that this condition of the bones disposing them to fracture from the slightest causes, is a different disease from that which was previously described, wherein the thinning of the walls was accompanied by softening of the texture of the bones, disposing them to bend rather than break; since, between these two states of the osseous system, there is really no other observable difference than in the relative proportions of the animal and earthy constituents of the affected bones—their chemical constitution is apparently the same.

Probably, the correct view of the changes occurring in the osseous system, through the whole series of cases included in this section, is, that they consist in a process of wasting or atrophy of the bones, determining, in some cases, a large removal of their earthy constituents, and in others, of their animal constituents, and so disposing them to bend or break, from the application of the slightest force. Although this wasting of the bones resembles in its characters the atrophy of them in old age, yet it does occur as a diseased affection, at all periods of life, and, as we have seen, often ends fatally. Our ignorance of the pathology of this affection must be acknowledged; and, whilst this

continues, it is to be expected that we shall remain, as we are at present, wholly ignorant of any curative measures, whereby such disease may be averted, or its progress arrested. Mr. Curling has adopted similar views of these conditions of the osseous system, in his Essay on "Some of the Forms of Atrophy of Bone*."

Medico-Chirurgical Transactions, Vol. xx.

CHAPTER III.

SCROFULA IN BONE.

It has appeared to me, that the bones are primarily affected in only a proportion of the scrofulous disease of joints. I cannot doubt the occurrence of two other forms of scrofulous disease in joints preceding, or independent of, the scrofulous disease of the bones,—one originating in inflammation of the synovial membrane, the other in inflammation of the cellular tissue around the joint. Acknowledging the uncertainty there may be in the definition of scrofulous disease, I desire simply to state, that I have watched the progress and termination of diseased hip-and knee-joints, which had exhibited the well-marked local and constitutional characters of scrofula: yet, upon examination, inflammation was found in the synovial membrane, with tuberculous deposit in the joint and around it, or there were scrofulous abscesses around the joint; whilst in the bones no unsoundness existed.

Our best observations of the incipient effects of scrofula in bone, are made in joints not covered by much thickness of soft tissues. Here, the increased heat, tenderness, and slight swelling of the bones, denote the existence of inflammation in them, occasioning increase of their vascularity, with the enlargement of them by expansion of their texture. In the elbow, and in the ancle-joint, when recently attacked by scrofulous inflammation in the bones, the hand grasping the joint, will readily recognize the greater heat in its bones than in the soft parts around them. When an examination is made of scrofulous bones in this early stage of disease, they are found expanded and congested, the medulla in their cells being mixed with blood. How long this stage of scrofulous disease in bone will endure, cannot be definitely stated. It is, however, certain, that it may continue many months; for, in instances where disease in a joint had so long continued, with

all the features of scrofula, yet, on examining the joint, no other morbid changes were found in it, than the simple inflammatory condition of its bones.

The change in scrofulous bone, next in the order of occurrence, is the disappearance of its earthy matter, which is often so complete, that the bone becomes readily compressible by the fingers. Then, the deposit of tuberculous matter into it ensues, either in a circumscribed cavity, hollowed out of the bone, or diffusedly through its cells; and, in some instances, also between the periosteum and the bone. The following analysis of a scrofulous bone in this stage of its disease, was furnished me by Dr. Bostock: "The circumstances in which this bone differed from the healthy condition of bone are—first, in the small proportion of its earthy matter, and more especially in the entire absence of the carbonate of lime: secondly, in the presence of an unusually large proportion of oil or fat, nearly equal in amount to the gelatinous basis of bone: thirdly, in the mechanical condition of the albumen, which appeared to have its ordinary structure nearly destroyed, and to be, the whole, or a considerable part of it, in a disorganized state*."

At the stage of tuberculous deposit in scrofulous bone, active inflammation, quickly passing into suppuration, is very apt to arise in it, as the effect, either of constitutional derangement, or of local injury; and, moreover, it constantly happens, that the smallest amount of irritation, however excited, and often arising without apparent cause, at this stage of the disease, is directly followed by suppuration, and its consequent processes of disorganization in the bone. For then, the walls of the bone ulcerate, affording outlet to the purulent fluid; and, with it, the tuberculous substance, and pieces of the diseased cancellous texture are discharged through the abscesses and ulcerated passages in the soft parts around the diseased bone, these constituting the chief phenomena of scrofulous caries.

To what extent is scrofulous disease in bone curable in the fullest sense, implying the perfect recovery of its healthy properties and structure? My reply to this question would be, that the disease is perfectly curable only in its first stage, when the changes in the bone have not passed beyond those of simple inflammation. That the disease is so far curable I have no doubt, from the observation of cases, chiefly in the knee, ancle, and tarsus, wherein, the expansion of the

* Illustration of scrofulous bone, exhibiting the diffusion of tuberculous matter through its soft cancellous texture, Plate 18, fig. 1.

bones, with the long-enduring heat and tenderness in them, had assured me of the character of the disease; yet, a considerable time afterwards, a year, and often two years, in conjunction with the most marked improvement in the general health, all signs of unsoundness in the bones that had been diseased, had wholly disappeared.

But when scrofulous disease in bone has reached the stage of tuberculous deposit, with an exception presently to be noticed, no other result is to be looked for than the destruction of part, or the whole, of the diseased bone. The tuberculous matter excites suppuration in the surrounding osseous tissue, just as tubercle in lung, or in absorbent gland, gives rise to abscess in the healthy tissue around it, leading to the ejection of the tuberculous matter from the part in which it was deposited. The exception just noticed, is but another analogy between the diseased processes in lung, or in absorbent gland, and in bone; for in the same way that tubercle in lung, or in absorbent gland, instead of exciting inflammation in the adjacent healthy tissue, may itself become changed into an earthy concretion, so does it appear, from good observation, that tuberculous matter in the cells of bone may become changed into a mass of earthy, or chalk-like substance. I had noticed the existence of masses of chalk-like substance in the cancellous texture of bones; but I did not interpret this morbid appearance in the way that Rokitansky has, I believe, correctly done, by regarding the chalk-like substance as the result of metamorphosis of tubercle in bone, analogous to the change it undergoes in other organs and tissues*.

Even the most disorganizing and destructive processes of scrofula in bone, are of slow progress, and unaccompanied by the inflammatory changes in the periosteum, which, in other diseases of bone, are followed by osseous deposits on its surface.

No reproductive process ever ensues upon the destruction of bone by scrofulous disease; hence, in the instances of its occurrence in the bone of a finger, shortening of the finger must be the permanent result, proportionate to the extent of bone that has been destroyed.

How frequently, and under what circumstances, tubercle in bone co-exists with its deposit in the lungs, is a question of interest in reference to the measure of removing a limb, when, upon good grounds, the opinion has been formed that disease, in one or more of its joints, commenced in scrofulous changes within the articular ends of the bones. The evidence which can be offered on this subject does not amount to more than the few following isolated facts.

* Pathologische Anatomie, Vol. i. p. 214.

"A man, twenty years of age, suffered from the symptoms of pulmonary phthisis, during which he received a severe blow upon his leg. In the examination of his body, tubercles were found in the lungs, also in the cervical, axillary, and mesenteric glands. At the part where the leg had been injured, the periosteum was found separated from the tibia, and there was here a round cavity in the bone, the size of a hazelnut, filled by a yellowish white substance, which, at its circumference, was solid, and could be crumbled in the fingers like curd."

"In the body of a man, forty years of age, tubercles were found in the lungs, also in the bodies of the vertebræ, and in the sacrum*." I find no mention of tubercle in bone by Louis in his account of the pathological anatomy of phthisis†, but it does not appear that he extended his inquiries into the condition of the osseous system. Even where there had been disease in a joint co-existing with phthisis which destroyed the patient, no mention is made of the condition of the bones; from which it may be inferred that they were not examined. From my own observation I can only state, that whilst in some instances I have found tubercle in the lungs co-existing with tubercle in the bones, in others, where tuberculous deposit had taken place in the bones of a diseased joint, yet the lungs were sound. But the record which I possess of cases bearing on this subject is insufficient for any conclusion respecting it.

It is well ascertained that tubercle is occasionally deposited in the bones of more than one joint at the same time. But more frequently, when tuberculous deposit is found in the bones of one joint, the primary changes from scrofula, not yet advanced to the tuberculous stage, are found in other bones; thus, for instance, in a limb removed on account of disease in the knee-joint, accompanied by tuberculous deposit in its bones, the bones of the ancle-joint are often found softened, slightly expanded, with their cancellous texture excessively vascular, and its cells filled by a serous and bloody fluid.

TREATMENT OF SCROFULA IN BONE.

No confidence can be held in local depletion as the means of removing the local inflammatory symptoms of incipient scrofulous disease in bone, and, consequently, of arresting its progress. The leeches or cupping, applied to a joint, in the bones, of which, scrofulous disease

* Andral. Clinique Médicale, Part III. Chap. iii, Section v.

† Recherches Anatomico-Pathologiques sur la Phthisie.

has commenced, will, it is true, lessen the tenderness and morbid heat in the part, but these symptoms will quickly return; nor will they yield to the repetition of the depletory treatment, which is moreover objectionable, from its tendency to weaken the system, and by so much, to lessen the constitutional powers of curing a disease, the essence of which, in respect to its cause, is debility. Nor will counter-irritation have a curative effect upon scrofulous disease of bone in its more advanced stages. Such are my convictions from observation, of the effects of depletory and counter-irritating measures directed to various bones affected by scrofulous disease. This, however, is a point which the observations of Sir B. Brodie had already well established*. Also, with respect to stimulating applications, in any degree of strength, and in any of their various forms, made to the soft parts covering scrofulous bone, my belief is, that their only certain effect, is that of rousing into activity, inflammatory processes in the diseased bone, tending to its disorganization and destruction.

When scrofulous disease is seated in the articular portions of bones, motion of the joint, and pressure of the articular surfaces against each other, ought to be prevented, for either of these will be likely to give rise to suppuration within the bones, and ulceration of the cartilages, with abscess in the adjacent soft parts. By the application of suitable apparatus, such as the splints constructed of prepared leather, or of gutta percha, these objects can be attained, and in a way not to interfere with the freest exercise of the body, which, in conjunction with its exposure to fresh air, especially at the sea-side, are the chief, indeed, I am disposed to say, the only, remedial measures deserving confidence, for the cure of scrofulous disease in bone. Accordingly, in the instances which are so frequent, of scrofulous disease attacking the tarsus or ancle, the patient has to submit to the inconvenience of taking exercise with his knee bent upon a wooden leg, as the means of relieving from pressure and motion, the articular surfaces of the diseased bones.

All other remedies for arresting scrofulous disease in bone, are, as it has appeared to me, but secondary and subordinate to the influence of sea-air. With respect to iodine and iodide of potassium, I have but to express the doubt I entertain of their beneficial effects in these cases. Not so with respect to the preparations of steel, and besides to cod-liver oil, which are beneficial, as the means of increasing appe-

* On Diseases of the Joints. Edit. 4.

tite, and improving nutrition. But even of these remedies, the impression I have of the amount of good they are capable of doing, is not such as to induce me to rely upon them exclusively. In hospital practice, the degree of power which these remedies have of arresting scrofulous disease in bone is clearly shown, and I would not say more of them, than that they keep the disease in a quiescent state. But when the position of the patient is such, that exercise and the constant exposure to fresh air, especially at the sea-side, are the available means of imparting to his system the vigor which is requisite for the reparative processes in bone, then may it be expected that the diseased parts will slowly regain their healthy condition, without the aid of the other measures that have been regarded as of secondary and subordinate importance.

One further consideration belongs to the treatment of scrofulous disease in bone; this is, the length of time required for its cure. Definite statement will here scarcely be looked for: it may be so far approached, that a shorter period than two years cannot be specified as the time required for the cure of the scrofulous bones of a knee, ancle, or tarsus. And here is the point of practical caution—that if the articular surfaces adjacent to the diseased bones are subjected to motion and pressure before the bones have regained their solidity and firmness, it will be done at the risk of exciting in them inflammatory processes leading to their disorganization and destruction.

CHAPTER IV.

HARD CARCINOMA, AND MELANOSIS IN BONE.

HARD CARCINOMA IN BONE.

THERE are instances of a deposit in bone identical with the hard cancer in the female breast.

I know of no instance of hard cancer in bone, where it occurred as a primary disease; and I know of no case where the primary cancer was situated elsewhere than in the mammary gland, and I should have added of the female, but for the remarkable case presently to be related, where the primary cancer occurred in the mammary gland of the male.

The carcinomatous deposit has been found in bones of various forms; in the medullary tissue of long bones, and in the cancellous texture of flat, and other-shaped bones. In the instances which I have seen, there did not appear to have been any change of structure in the bone, preceding the deposit of the carcinomatous substance. This deposit takes place in the form of minute, round granules, which, as they increase, coalesce into a solid firm mass, of a light greyish-blue color, apparently homogeneous in its composition, without intersecting fibrous bands, and, of course, without the white streaks produced in carcinoma of the mammary gland by obstruction, or other change in the lactiferous tubes. The carcinomatous granules coalesce, either into separate masses, or into one continuous mass, extending widely through the bone, thus giving rise to the alleged varieties of circumscribed or tuberous, diffuse or infiltrated, cancer in bone. In the case which will be presently related, many of these varieties were observed; thus, in the sternum, the carcinomatous substance pervaded the cancellous texture throughout, whilst, in the humerus, minute carcinomatous granules were scattered through the unaltered medulla, and at one part they had coalesc-

ed into a tumor the size of a walnut, which had caused the absorption of the adjacent walls of the bone.

The changes which ensue in a bone, the seat of cancer, are the absorption of its cancellous texture and walls, as the carcinomatous substance gradually extends from the interior to the outside of the bone. Thus, as the disease advances, the walls of the bone become gradually thinner at the seat of it, and in most instances, they suddenly yield on the occasion of some slight effort, or movement of the limb, just as spontaneous fractures occur in the instances of thinning of the walls of bones from atrophy or disease, unaccompanied by morbid deposit in their interior.

Whilst, in some instances, the carcinomatous substance has been deposited to the extent of filling the entire medullary and cancellous texture of a bone, and has, besides, penetrated its walls, in no case with which I am acquainted, has the carcinomatous substance extended so far beyond the walls of the bone, as to form a tumor projecting from it, in the manner of other morbid growths.

In several instances, as in the case presently to be related, in conjunction with carcinoma in bone, carcinomatous deposits were also found in the lungs, showing the formation of this disease in the osseous system, to be connected with the general diathesis, leading to its deposit in one or other organ, determinable by circumstances of which we have no knowledge. And in correspondence with this view of the subject, is the fact already noticed, of there being no diseased action in the bone previous to the deposit of the carcinomatous substance, which, consequently, in the early stage of the disease, is found scattered through the unaltered medullary and cancellous tissue

In illustration of the foregoing history of carcinoma in bone, the following case is related, which presents all the striking features of the disease; and is besides of interest, from the circumstance of the disease being here consequent on the occurrence of carcinoma in the mammary gland of the male.

A man, forty-five years of age, of temperate habits, by occupation a butcher, was admitted into St. Bartholomew's Hospital, with the following history of his disease,—that his general health, until very lately, had been good; that about nine months ago, he first perceived a small hard lump close to the nipple of the right breast, which slowly increased without pain; and that about three months ago the tumor ulcerated in its centre. The tumor was about the size of half an egg, circumscribed, of a roundish form, very firm, closely adherent to the

skin, but loosely united to the cellular tissue behind it, upon which, therefore, the tumor was freely movable. In the axilla there was a mass of enlarged and indurated absorbent glands. About four months ago, he began to feel a shooting pain in the lower part of the right arm, which increased, with thickening of the tissues immediately around the bone; and a few days after his admission, it was discovered that the humerus had here given way. About the same time, he began to complain of pain in his back; also, of coldness and numbness, and of the failure of the power of motion in his lower limbs. A few weeks afterwards, he suffered such severe pain in the upper part of the left arm as to indicate the probability of the bone being here diseased. The loss of the power of motion in his lower limbs became complete. His constitutional powers gradually failing, he sank about fourteen months from the commencement of the disease in the breast.

The tumor occupying the situation of the mammary gland consisted throughout of a solid hard substance, which, in its composition, appeared to be identical with that of hard cancer in the female breast. The indurated axillary absorbent glands presented the same structure as the tumor of the mammary gland. In the left humerus, granules of carcinomatous substance, varying from the size of a pin's head to that of a pea, were scattered through the medullary tissue. About the centre of the bone, there was a large mass of carcinomatous substance, filling the medullary tube, and penetrating its walls. There also was carcinomatous substance deposited in the cancellous texture of the head and neck of the humerus; and, in the latter situation, it extended completely through the walls, which had in consequence given way, in the manner of a spontaneous fracture. In the lower part of the right humerus, there was carcinomatous substance filling the medullary tube, and penetrating the walls of the bone. Within the sternum the cancellous texture had wholly disappeared, and its place was occupied by carcinomatous substance extending through the bone. Within the bodies of the five lower dorsal vertebræ, carcinomatous substance was deposited, and the entire body of one of these vertebræ had wholly disappeared, its place being occupied by the carcinomatous substance; here, therefore, a vacancy existed in the front of the spine, communicating with the spinal canal. Opposite this vacancy, the spinal cord and its membranes were very vascular, but not otherwise unhealthy. Carcinomatous substance was deposited in the bronchial glands. Also, over the surface of each lung, immediataly beneath the pleura, there were numerous small carcinomatous deposits. The carcinomatous sub-

stance, found in the bones and in the internal organs, presented exactly the same character as that composing the tumor of the mammary gland*.

MELANOSIS IN BONE,
CARCINOMA MELENODES (MULLER).

Melanosis in soft structures consists in the deposition of fine molecules of a brown or black matter, either in the parenchyma of organs, or in the meshes of a fine fibrous or cellular tissue, in the form of a distinct tumor. The first is the almost invariable form of melanosis in bone, the brown or black matter being deposited in the tissue of the bone, either in isolated patches, or diffusedly through it. There have, however, been instances, although very rarely, of the growth of a melanotic tumor from a bone. One such case is related by Müller, in which v. Graefe removed a large lobulated melanotic tumor from the lower jaw, with the portion of the bone in which it originated†.

Melanosis in bone has very rarely occurred as a primary disease; its general, and perhaps invariable, character has been that of a secondary disease, manifesting itself in instances where there had been melanotic deposits in some of the soft structures, but more especially in the eye, and in the skin.

The bones in which melanotic matter has been most frequently deposited are, the cranium, ribs, vertebræ, and sternum; and it has been found in several bones of the same individual.

The deposit of melanotic matter in bone simply stains it, and produces upon it no other effect; no inflammatory action is, in consequence, set up in the bone, and none of the organic changes in it ensue, which are consequent on other morbid deposits in the osseous tissue.

The following are examples of the melanotic deposit in bone.

A case is related by J. F. Lobstein, in which the cancellous texture through the lower third of the femur was infiltrated with melanotic matter; other deposits of the same character were found upon the periosteum, and between the periosteum and the bone‡.

Two cases are related by Sir A. Halliday, in which melanotic matter was deposited in various soft organs, and in several of tha bones:

* These several specimens of carcinoma in bone are preserved in the museum of St. Bartholomew's Hospital. One of them is represented, Plate 17, fig. 4.

† Essay on the Nature of Cancer.

‡ Traité d'Anatomie pathologique, t. i. p. 460.

in one case, the cancellous texture of the sternum, ribs, and cranial bones was blackened by it; and in the other, the cranial bones alone*.

In the museum of St. Bartholomew's Hospital, there are specimens of melanosis in the vertebræ, rib, and cranial bones, from the case of a young female, in whom melanosis formed in the skin of the back, and afterwards in nearly every organ of the body†.

* London Medical Repository, June—September, 1823.

† First series, Nos. 190, 191, 192. Thirty-fifth series, No. 23.

PART IV.

CHAPTER I.

MORBID GROWTHS FROM THE JAWS.

THERE are diseases having their origin in the gum, or in the mucous membrane adjacent to it, which, in their progress, exhibit, in some respects, the features of morbid growths from the bone of the upper, or lower jaw. One of these diseases originating in the gum, is called Epulis, another form of disease, originating, either in the gum, or in the adjacent mucous membrane, exhibits the same characters as the disease originating in mucous membrane elsewhere, and designated Epithelial Cancer.

DISEASE OF THE GUM DESIGNATED EPULIS.

This disease appears either as a simple enlargement or hypertrophy of the gum, or as a circumscribed tumor growing from the gum, and occasionally attached to it by a narrow pedicle. It occurs in children, as well as in adults; and it is usually of slow progress. It constitutes a hard, painless swelling, projecting from the alveolar border of the jaw. The surface of the swelling is at first smooth, but, in increasing, it becomes tuberculated, softened, and ulcerated, from the pressure of the teeth against it, and there is often profuse bleeding from it. As the swelling increases, it extends around the teeth and encloses them, and then it often appears to have originated in their sockets.

In some instances, this disease is found to consist of nothing more, than enlarged and indurated gum; but, in others, it consists of a dense fibrous tissue and irregularly scattered particles of bone. I removed one of these tumors from the outer plate of the alveolar process of the upper jaw, which was composed of a dense fibrous tissue, with a nucleus of true bone.

This disease presents no other feature of malignancy than its strong tendency to reproduction, if every particle of the morbid substance, with, besides, the surface, whether it be of a soft tissue, or bone, to which it was attached, has not been completely removed. The production of this disease cannot be ascribed solely to irritation from decayed teeth, since it occasionally appears where the teeth are sound.

There have been instances of this disease spreading from the gum into the mucous membrane of the palate, producing the enlargement and induration of it; and, in one case, which I saw, the morbid substance had penetrated the socket of a molar tooth into the cavity of the antrum.

In some instances of this disease, I have found the adjacent bone hardened by inflammation; and in others, I have found the surface of the bone, which had been overlapped by the morbid structure, ulcerated.

DISEASE ORIGINATING IN THE GUM, OR IN THE ADJACENT MUCOUS MEMBRANE, DESIGNATED EPITHELIAL CANCER.

This disease occurs in adults, and, in most instances, before the age of fifty. It commences in swelling and induration of the gum, or of the mucous membrane adjacent to it, and the diseased surface becomes wart-like and ulcerated. The disease spreads slowly, but widely upon the gum into the mucous membrane of the cheek and palate, or into the floor of the mouth. Deeply ulcerated clefts form in the diseased mucous membrane, with the growth of soft fungous excrescences around them. The morbid structure is very vascular; if cut into, or otherwise injured, it bleeds profusely. But little pain accompanies the disease; and it does not affect the general health. I saw a case where it had been seven years in progress, yet the general health was unimpaired; and in several other cases, the absence of pain in the diseased structures, and the good health of the patients, were especially observed.

It is well to remark, that the development of this disease has ensued from the irritation excited in a simply enlarged and indurated gum. In one such case, which I saw, enlargement of the gum had existed for several months, when incisions were made into it, and these were filled with lint and powdered alum. The wounds degenerated into a foul ulcer with raised and everted edges, which showed no disposition to heal. Caustics, and other irritants, were applied to the ulcer, but it spread widely upon the inside of the jaw and cheek, and through the gum and periosteum to the bone, and, at the same time, the absorbent glands under the jaw became enlarged and indurated. But with all this disease, the patient suffered no pain, and his health remained good until, from the extent of the disease, he was prevented taking sufficient food for his sustenance. Here, it appeared but little doubtful that a simple epulis, by the irritating treatment it had received, was converted into an epithelial cancer. At all events, the case instructs us not to treat an epulis otherwise than by the removal of the morbid structure.

Notwithstanding the slow progress of this disease, it presents malignant features, in its tendency to invade the adjacent soft tissues, and in its contamination of the adjacent absorbent glands. As the disease spreads upon the upper or lower jaw, the morbid substance adheres to the bone, and dips into the sockets of the teeth, out of which, in consequence, it may be supposed to have grown.

Examination of the structure of epithelial cancer shows it to consist chiefly of a yellowish-white, soft substance, resembling the scrapings of macerated epidermis, and, under the microscope, exhibiting well-marked epithelial cancer-cells. In an instance of this disease originating in the gum of the lower jaw, where I removed an absorbent gland enlarged to the size of a filbert, which lay upon the sub-maxillary gland, there was within the capsule of this absorbent gland a mass of soft, white substance, presenting the same resemblance to the scrapings of macerated epidermis, and the same cancer-cells as were observed in the growth detached from the alveolar border of the jaw. The bone adjacent to this disease has been found hardened in some cases, and ulcerated in others.

TREATMENT OF EPULIS, AND OF EPITHELIAL CANCER OF THE GUM, &C.

I include the treatment of these diseases under one head, as there is but one consideration involved in it—the necessity of thoroughly

removing the diseased parts with the tissues to which they have acquired attachment. And, of course, this can be done far more satisfactorily when the disease, of small extent, is limited to its original seat. Therefore, it is important that the disease should be recognized before it has crept, as it is apt to do, irregularly and indefinitely into the surrounding structures.

It is essential that the surface of bone, whatever may be its extent or situation, to which the morbid substance has acquired attachment, should be removed, for unless this be done, reproduction of the disease is almost sure to ensue. And when the disease has penetrated the alveoli, these must be freely removed to their extremities; and, in the lower jaw, it will be expedient to remove with the alveoli, the canal in the bone, lodging the dental nerve and vessels; for, in a case where I had taken away a large piece of the jaw through its entire depth, the dental canal was found filled with morbid substance, of exactly the same character as that which, originating in the gum, was attached to the alveolar border of the jaw.

On the question of removing these diseases by the knife or caustic, my preference is decidedly for the former. Caustic, in any form, cannot fulfil with certainty and precision the essential condition of the operation, which is to remove the diseased structures with the healthy tissues to which they have acquired attachment. I have known some instances of these diseases, when of limited extent, successfully treated with caustic; but I have known instances of its failure, even in experienced hands, and under circumstances in which, I believe, the free excision of the diseased parts would have been the means of a permanent cure.

The operative proceedings required in these cases, when, with the diseased soft parts, it is necessary to remove a considerable portion of the upper, or lower jaw, are the same as in the cases of morbid growths from the jaws presently to be considered. Here, however, it may be well to observe, that in the instance of an epulis, or epithelial cancer, spreading upon the lower jaw, it will be desirable to remove the portion of the bone to which the diseased structure has attachment, without extending the incision of the jaw through its entire depth. To preserve even a narrow portion of the base of the jaw is of consequence, as the outline of the face will not then be interfered with, nor will the powers of mastication be impaired, by the falling inwards of

the portions of the bone which are left, as is likely to happen after the removal of the entire front of the jaw.

The following case is a good illustration of the progress of an epulis, originating in the gum of the upper jaw, and of the operative proceedings required for its removal.

Epulis on the Upper Jaw. A young female consulted Mr. Abernethy on account of an enlargement of the gum. He stated it to be a growth of cartilaginous substance from the gum, and advised its removal, to which the patient would not consent. The enlargement very gradually increased, so that at the end of eight years from its commencement, it formed a tumor, projecting into the mouth, the size of a walnut; but it had been wholly free from pain. The chief direction of the increase of the tumor was from the gum upon the palate. I was now desired to undertake its removal. To obtain a full view of its extent, I found it necessary to divide the cheek from the angle of the mouth to the prominence of the os malæ. I then separated the tumor from the palate and alveolar process, denuding the bone of its periosteum; and, in doing this, I found that part of the alveolar process had been absorbed, but the exposed surface of bone appeared to be so perfectly healthy in texture that the removal of it was not considered necessary. About three hours after the operation, the patient ejected a pint of blood from her stomach; this appeared to be the accumulation of the blood, flowing from many small divided vessels, which had passed into the pharynx.

The exposed surface of bone became speedily covered with healthy granulations, which soon acquired the smoothness and softness of the free surface of mucous membrane. There was no reproduction of the disease. The tumor was composed of granules of a firm unctuous substance, contained in cells, divided by fibrous septa.

This case presents an exception to the rule of removing the surface of bone from which an epulis grows; still, however, the rule must remain as the general result of experience.

To the question, whether an epithelial cancer of the mouth is a fit case for the operation, when it co-exists with enlargement of the absorbent glands under the jaw, I am disposed to reply, that its removal may with propriety be undertaken, when only one or two absorbent glands are enlarged, and when these are so moveable and superficially situated, as to admit of being easily taken away. This statement is founded on the present condition of our knowledge respecting the disease here distinguished by the term Epithelial Cancer, which is to the

effect of its possessing so much of the character of a local disease that, if the whole of the contaminated parts are taken away, the patient will have a good prospect of remaining well. Acting on this view of the subject, I have removed, with a satisfactory result, the whole chain of enlarged superficial absorbent glands from both sides of the groin in a case of epithelial cancer affecting the external genital parts in the female. And in a case of the chimney-sweepers' disease of the scrotum, which is also an example of the epithelial cancer, with the removal of the entire integuments of the penis and scrotum, I have, at the same time, taken away the indurated absorbent glands from both groins; the parts healed soundly, and so long as the patient remained under my observation, there was no return of the disease.

MORBID GROWTHS FROM THE LOWER JAW.

Most of these growths originate in the cancellous texture between the two plates of the jaw. Indeed, it is doubtful whether all the morbid growths stated to arise from the outer surface of the jaw, have not been instances of epulis, or epithelial cancer, originating in the gum, or mucous membrane adjacent to it, and, in their progress, acquiring attachment to the bone.

The following are the varieties of morbid growth from the lower jaw which I have seen: there may be others, of rare occurrence, which I have not happened to meet with.

1. A white, compact, opaque substance, through which particles of bone are scattered, originating in the interior of the jaw. This substance has not the same degree of firmness, or the semi-transparency and elasticity, or the noduled form of enchondroma. It is not manifestly fibrous, yet it would probably be considered to belong to that class of morbid growths.
2. A grey, dense, manifestly fibrous tissue; in some instances originating apparently in the interior of the jaw, and, in others, from its alveolar border and outer surface. It is probable, that in the latter case this was an epulis, commencing in the gum.
3. Soft, encephaloid substance, originating in the interior of the jaw.
4. Fatty substance, in granules, intermixed with cells containing a glairy fluid, originating in the interior of the jaw.
5. A soft, very vascular substance, of the character of erectile tissue, originating in the interior of the jaw.

6. Cartilaginous substance, with osseous particles scattered through it. In the museum of the College of Surgeons, there is an instance of this growth of great magnitude, from the jaw of an adult female.
7. Membranous cysts, containing a glairy fluid, originating within the jaw. These cysts, in enlarging, usually cause expansion of the walls of the jaw, and they are found to possess more or less complete osseous parietes, apparently formed by hypertrophy of the cancellous texture of the jaw. Occasionally, the membranous cysts, instead of expanding the walls of the jaw, cause the absorption of its outer wall, so that the tumor they form, projects on the outside of the jaw. This disease is usually of slow growth; and there have been instances in which the tumor of the jaw, formed by it, has acquired a large size.
8. Osseous growths from the jaw; exostoses. Some of these are so hard as to be ivory-like; others not so hard, being composed of cancellous texture. There are, also, growths from the jaw, consisting in part of soft fibrous tissue, and in part of osseous substance. In such tumors, the osseous substance usually constitutes their base, and it is disposed, either in a solid mass, or in laminæ and fibres, hence the appellation which has been bestowed upon this disease, "the foliated, or needle-shaped exostosis."

In the instances of the simple, hard, osseous exostosis, it may be expected, that the part of the jaw from which it grows will be healthy; but not so with respect to the other growths from the jaw. Most of these originate in disease of the bone.

The cartilaginous tumor of the lower jaw is that which grows to the largest size. An ulcerative, or sloughing, process has, in some instances, ensued in the centre of this tumor, analogous to the softening and breaking up of cartilaginous tumors growing from other bones.

Morbid growths, originating within the lower jaw, are usually, in part, surrounded by a thin osseous shell, and intersected by thin osseous plates, apparently some remains of the original walls and cancellous texture of the bone. The thin osseous shell of the tumor is discovered by its yielding to pressure, with a sense of crepitation, and by its recoil, when the pressure is remitted. This character belongs more particularly to the tumor of the jaw caused by the formation of membranous cysts within it; for in this disease, more than in any other to

which the jaw is liable, the walls of the bone are likely to become expanded into a thin crepitating shell, and hence the recognition of it has been set down as a diagnostic sign, distinguishing this from other diseases of the jaw.

A morbid growth, originating within the lower jaw, usually projects from its alveolar border into the mouth, before it causes any expansion of the walls of the bone, and thus the disease first appears around the necks of the teeth, or protrudes from the socket of a recently extracted tooth. When the disease is confined to the inner or outer side of the jaw, it may be suspected to have originated in the surface of the bone; or, more probably, that it was an epulis, or epithelial cancer, originating in the gum. In some rare instances, the tumor of the jaw in enlarging, instead of projecting into the mouth, has extended downwards into the neck.

Morbid growths from the lower jaw occur most frequently in the early and middle periods of life, rarely in old age.

An osseous cyst, originating in the outside of the lower jaw, has so closely resembled the tumor of the jaw resulting from the expansion of its walls, as to render the diagnosis somewhat difficult. In illustration of this point, I relate the following case, which occurred in St. Bartholomew's Hospital, under the care of Mr. Earle. A man, aged twenty-three, was admitted, with a tumor projecting from the outside of the jaw, midway between its symphysis and angle. It was of the size of a walnut, smooth and round, its base was firm, but its central and most prominent part yielded to pressure, with a crackling sensation. It was stated, that the tumor had commenced three years previously, and that it had increased very slowly, and without pain. Doubt arising with respect to the sort of connexion which the tumor had with the jaw, part of it was separated from the bone, which exposed a large cavity filled with a glairy fluid. Further exposure of this cavity showed the tumor to consist of an osseous cyst, attached to the outside of the jaw. A thick, very vascular, membrane lined the cyst, and within it, the canine tooth of the second set was seen projecting, with its fang attached to the membrane lining the cyst. About two-thirds of the cyst were taken away, and the rest of it was left attached to the jaw, but it did not interfere with the healing of the wound and the complete cure of the disease*.

* Portion of the cyst which was removed. Museum of St. Bartholomew's Hospital, First series, No. 119, Plate 18, fig. 2.

Morbid growths from the lower jaw, even when of large size, are usually more favourable for removal than those originating in the upper jaw, their outline and connexions being, in general, better defined: they do not extend indefinitely into the surrounding osseous and soft structures, as the tumors of the upper jaw are apt to do. Accordingly, provided that the tumor of the lower jaw does not present features of malignancy, although it may be of great size, and implicate a large portion of the jaw, the removal of the tumor, and of the portion of the bone from which it has arisen, can be effected with certainty, and with the prospect of a satisfactory result. For it is true, that operations upon the lower jaw are, in general, followed by a less amount of constitutional disturbance, than ordinarily ensues from operations of the same magnitude in other situations. The results of these operations which have been performed at St. Bartholomew's Hospital fully agree with this statement: and, in seven cases which have been recorded by Mr. Cusack, the patients, with one exception, had in a few weeks completely recovered from the operation. In the unfavourable case, erysipelas ensued, terminating in sero-purulent effusion into the cellular tissue around the larynx and within the glottis*. It is recorded, that Dupuytren removed portions of the lower jaw in eighteen or twenty cases; that in one of these, the result was fatal, from inflammation extending to the larynx, and that in two others, the disease, which was stated to be cancer, recurred at distant periods; but that, with these exceptions, the operations were successful†. In one of the cases, where I removed the portion of the jaw between its symphysis and ramus, no constitutional disturbance ensued; the whole tract of the wound united by adhesion; and on the eighth day the patient left her bed and moved about in good health.

A large proportion of the tumors of the lower jaw are local diseases of an innocent character; but it is to be remembered, that there are morbid growths originating in the lower jaw, which contaminate the absorbent glands and other parts in their neighbourhood. Here, as elsewhere, it is difficult to distinguish, by their external characters, the tumors which are malignant from those which are not so; and, like the morbid growths from other parts, it has happened that a tumor of the lower jaw, which presentid no malignant feature in its early stage, has suddenly, perhaps after the lapse of years, assumed wholly new charac-

* Dublin Hospital Reports, Vol. iv.

† Leçons Orales, t. iv. p. 65.

ters, then rapidly increasing, becoming painful, and undergoing the changes of malignant disease.

OPERATIONS UPON THE LOWER JAW.

When considering the operations upon the upper jaw, an objection will be urged against the use of chloroform, or æther in these operations, on the ground, that the glottis, deprived of its irritability, may permit the passage of blood into the trachea. This objection does not apply so forcibly to operations upon the lower jaw; the parts implicated in them not being so deeply situated, the blood will more readily escape through the external wound. But to guard against the possibility of its descending towards the larynx, the patient, during the operation, should sit upright, without reclining in the least.

In the removal of morbid growths from the lower jaw, the incisions require, of course, to be varied according to the situation and extent of the disease, which is not always possible beforehand to ascertain. Thus disease originating within the jaw, is occasionally found to extend through its cancellous texture much beyond the limits indicated by the enlargement, or other alteration, of the bone.

In instances where a morbid growth of small extent implicates only a portion of the front of the lower jaw, its removal may be effected by an incision wholly within the mouth, and, accordingly, without any external wound. If, in such a case, it is deemed necessary to divide the skin, an incision should be made along the lower edge of the jaw, of sufficient extent to allow a flap of integuments to be turned upwards.

For the removal of a tumor occupying one lateral half of the body of the jaw, from the angle to the symphysis, a single incision will be sufficient, commencing a little above the angle, and continued in a curved line downwards and forwards, along the base of the jaw, and then a little upwards upon the chin. If the tumor is large, or implicates the ramus of the jaw, it may be necessary to continue the incision from the chin upwards, through the middle of the lip, in order that a flap of skin, comprising the entire cheek, may be reflected upwards, for the object of bringing the whole extent of the disease into view. Or, such may be the form and situation of the tumor, that it will be expedient to extend the incision from the ear, straight downwards to the angle of the jaw; next, along its lower edge to the chin, and then

upwards, through the middle of the lip. Thus a large flap of skin will be formed, comprising the entire cheek and half of the lower lip. It is desirable so to direct these incisions, that the cicatrix they will leave may be away from the front of the face; also, that the parotid duct and the principal branches of the portio dura may not be interfered with.

The several steps of the operation of removing a portion of the lower jaw, are to be executed in the following order: first, the removal of any teeth that may be in the way of the division of the jaw; secondly, the incision of the skin, and its separation, with the subjacent muscles, from the outside of the jaw; thirdly, the division of the bone; and, fourthly, the detachment of the soft parts from the inside of the jaw. Thus will be left, to the last stage of the operation, the only proceeding with which danger is connected, namely, the detachment of the genioglossi muscles from the jaw, which might be followed by retraction of the tongue. Whilst the saw is in action, a narrow spatula, pushed upwards on the inside of the jaw, will protect the soft parts from injury.

It may be necessary, before completing the incisions, to tie the divided ends of the facial artery, and any bleeding vessels there may be in the deeper part of the wound should be secured, that there may be no risk of secondary hæmorrhage. In some of the operations which have been performed upon the lower jaw, a ligature was placed, in some cases, upon the common carotid, in others, upon the external carotid, as a security against hæmorrhage; but the divided vessels bled as freely as if this had not been done. A large portion of the lower jaw may be removed without dividing any other artery, of consequence, than the facial. Deep-seated arteries of magnitude are to be avoided, by making the incisions close to the bone, or to the tumor occupying its place. Further, it is to be observed, that whilst the disease is in progress, the adjacent arteries, even when of large size, often become obliterated, so that when divided, no bleeding ensues.

Every care is to be taken, in dressing the wound, to secure the union of the divided integuments by adhesion. The use of many fine sutures, with thin pins and strips of isinglass plaster placed over them, are the best means of obtaining this desirable result.

When the disease is confined to the alveolar border of the jaw, the removal of it may be effected without extending the division of the bone to its base. Sir P. Crampton, in such a case, removed a triangular

piece of the jaw, including the sockets of the two small molar teeth, by means of a fine watch-spring saw, and there was no reproduction of the disease*. It is certainly most desirable, whenever practicable, to leave the base of the jaw entire; for, however narrow the portion of bone may be that is left, it will preserve the natural outline of the face, and prevent any material interference with the powers of mastication.

After the removal of a large portion of the front of the jaw, including its base, the lateral portions of the bone are very apt to fall inwards, whereby the molar teeth cannot be applied to those of the upper jaw, and thus the power of mastication will be wholly lost. In such instances, the two portions of the jaw do not fall inwards simply from the want of support, but they are drawn forcibly inwards by muscular action, probably by the mylohyoïdei muscles. In a youth, from whom I removed a large portion of the front of the jaw, the lateral portions of the bone became drawn so considerably inwards that he wholly lost the power of mastication. I interposed wedges of cork between the two portions of the jaw, and tried various other contrivances, but ineffectually; the molar teeth could not be brought opposite to those of the upper jaw. Subsequently, however, this patient derived much advantage from the adaptation of a row of false teeth to the two portions of the jaw. It improved the appearance of the mouth, supported the lower lip, and prevented the constant flow of the saliva over it; and it appeared probable, that, by means of the false teeth, he would, in some degree, regain the power of mastication.

In order to guard against the ill consequences just described, after taking away the front of the lower jaw, it is desirable that, from the time of the operation, the two lateral portions of the bone should be kept in their places by inserting between them an arch of ivory, having its extremities fixed to the molar teeth by metallic caps, or rings, enveloping them; or, for the same object, it has been recommended that a silver plate, hollowed on its upper and lower surfaces, for the reception of the molar teeth, should be constantly worn in the mouth; and to obtain the full advantage of this proceeding, it will be necessary to have the silver plate fitted to the crowns of the molar teeth some days previous to the operation.

When it is intended to remove the entire ramus, it may be convenient to divide the jaw a little below its neck; and then, after removing the tumor and the portion of the jaw connected with it, to disarticulate

* Dublin Hospital Reports, Vol. iv.

the condyle. The joint of the jaw should be opened on its front part; if this be done from behind, there will be danger of wounding the internal maxillary artery, from its proximity to the incisions.

In an instance of disease confined wholly to the ramus of the jaw, its removal, with the disarticulation of the condyle, can be effected by an incision directly over the ramus, and continued around it, but not extending into the cavity of the mouth. Mr. Syme has recorded a case showing the successful result of this proceeding*.

The division of the jaw will be conveniently effected, either by the saw alone, or by first making a deep groove in the bone with the saw, and completing its division with the cutting forceps.

When removing the front of the jaw, on separating the genioglossi muscles from the bone, the tongue has been retracted into the mouth so deeply as to cover the glottis, and thus to cause suffocation. Dr. Warren states that, in removing an extosis of the lower jaw, "when about to sever the lowest remaining muscles, he perceived the tongue drawn back into the pharynx, and the patient in a state of suffocation." He adds: "Immediately seizing the tongue with the left hand, I drew it out of the pharynx, and, confiding it to a friend, completed the section, and prepared a large needle and ligature to transfix it. This happily was not necessary. After waiting five minutes, the spasmodic action ceased, and did not return†." Dupuytren refers to a case, in which, to prevent suffocation, tracheotomy was at the instant performed; and he states, that in his own operations, he had prevented retraction of the tongue by grasping its point firmly, with the aid of a piece of dry linen, at the instant of dividing its attachments to the jaw‡. Other instances of retraction of the tongue, in operations upon the jaw, have been recorded by Lisfranc, and by Velpeau§.

It is probably by the action of the styloglossi muscles, that the tongue is drawn backwards into the pharynx, when the antagonizing power of the genioglossi muscles is lost. Retraction of the tongue did not occur in any of the operations upon the lower jaw which I have witnessed. At the instant of its occurrence, the operator should be prepared to seize the apex of the tongue, and draw it forwards with the help of a piece of dry linen. Security against its retraction may be obtained, by passing through its apex, a strong thread, by means of

* Contributions to Pathology and Surgery, 8vo.

† Surgical Observations on Tumors, p. 115.

‡ Leçons Orales, t. iv.

§ Lancette Française, Août, 1836. Eléments de Médicine Operatoire, t. i. p. 546.

which it can be kept forwards during, and for some time after, the separation of the attachments of the genioglossi muscles from the jaw.

The utmost extent of the reproductive power, ensuing after the removal of a portion of the lower jaw, consists in the formation of a dense fibro-cellular tissue between the ends of the bone, connecting them so firmly that the two portions will move accurately together, and with sufficient force for mastication.

A case has been recorded, in which both lateral portions of the lower jaw, leaving only a small portion of it at the symphysis, were removed at two operations, with an interval of six years between them. A tumor arose from one side of the jaw, and afterwards a similar tumor arose from its other side. On the right side, the sections of the jaw were made a little above the angle, and a little anterior to the mental hole. On the left side, the condyle was disarticulated, and the anterior section was made immediately in front of the canine tooth. The advantages derived from leaving the symphysis were, that the attachments of the genioglossi muscles being preserved, the retraction of the tongue was prevented, also that the support of the lower lip being preserved, the constant flow of the saliva from the mouth was prevented; it was, besides, considered, that if the attachments of the genioglossi muscles were preserved, the patient would be better able to speak and to swallow. The result of this case was most favourable*.

The operation of removing portions of the lower jaw, constitutes one of the most remarkable of the achievements of modern surgery. It appears, that the first of these operations was performed by Mr. White, at the Westminster Hospital, in the year 1804. But it does not appear that the operation was repeated until the year 1821, when it was performed by Dr. Valentine Mott, of New York†.

MORBID GROWTHS FROM THE UPPER JAW.

Morbid growths from the upper jaw, in a large proportion of cases, originate within the antrum. Hence, with reference to the operations required for their removal, an exact knowledge of the relations of the

* Case by Mr. Spence. Edinburgh Medical and Surgical Journal, April, 1843.
† Medical Gazette, March, 1846.

walls of the antrum to the adjacent bones is of so much importance, that I shall here introduce the following particulars in the anatomy of this part of the superior maxillary bone.

The upper wall of the antrum is the floor of the orbit; its posterior wall is the boundary of the zygomatic fossa; its lower wall comprises the sockets of the bicuspid and molar teeth; its inner wall is the boundary of the nose; and its front wall is the boundary of the cheek. The several walls of the antrum are thicker in the child than in the middle period of life. The upper wall is the thinnest.

The cavity of the antrum has, in most instances, the form of a triangular pyramid, with its apex towards the os malæ, and base towards the nose. Thin plates of bone are often found extending across the cavity. The dimensions of the central part, or body, of the superior maxillary bone, indicate the extent of the antrum. A good practical view of the extent of its cavity is furnished in the following history:—

"A lady suffering tooth-ache, submitted to the extraction of the canine tooth of the upper jaw, with which a portion of the alveolar process was removed, making an aperture in the antrum, from which a watery fluid constantly issued. The patient, desirous of ascertaining the source of the discharge, took a pen, and having stripped off the barbs from the feathered part, she found that the whole of it, full six inches long, could be introduced into the cavity. At this she was greatly terrified, believing it must have gone into the brain. She consulted Highmore, who explained to her that the pen had turned spirally within the sinus, and he, besides, counselled her to submit with patience to the inconvenience of the discharge from the cavity*."

In the inner wall of the antrum, is the aperture of communication with the nose. In the separate bone, this is, in some instances, single, and so large as to allow the passage of the little finger through it; in other instances, there are two small apertures, separated by a thin plate of bone. In the entire and recent head, the aperture is so much narrowed by the ethmoid bone, by the vertical plate of the palate bone, and by the inferior spongy bone, as well as by the pituitary membrane passing through it, that it will but just admit the passage of a probe. This aperture is usually situated at some distance from the lower wall of the cavity; consequently, in the erect posture, fluid will not escape from the antrum until a certain quantity has accumulated

* Drake's System of Anatomy. Two vols. 8vo. 1707.

within it. Only in the horizontal posture, and with the opposite cheek downwards, will the aperture in the antrum be favourably situated for the passage of fluid into the nose. In some instances, from the disposition of the pituitary membrane, the aperture is very oblique. There may be one or more small apertures in the lower wall of the antrum, communicating with the sockets of the molar teeth.

The membrane lining the antrum is thin, loosely adherent to the bone, but little vascular, and smooth on its free surface; its characters more resemble those of serous than those of mucous membrane.

Although, in the operation of taking away the superior maxillary bone, the proceedings are necessarily varied according to the extent of the disease, it may be well to mark the lines of connexion of the superior maxillary with the adjacent bones. The posterior part of the superior maxillary bone is simply in contact with the front surface of the pterygoid process of the sphenoid bone. The lines of firm osseous connexion of the superior maxillary with the adjacent bones are, inferiorly and mesially, by its alveolar and palatine processes, with the opposite bone; posteriorly, by its palatine process, with the palate bone; superiorly and internally, by its nasal process, with the nasal, frontal, and lachrymal bones, also by its orbitar process, with the lachrymal and ethmoid bones; superiorly and externally, by its orbitar and malar processes, with the malar bone.

In explanation of the fact, that morbid growths arise in the antrum more frequently than in any other nasal sinus, its direct connexion with the sockets of the molar teeth has been usually referred to. Certainly, in a large proportion of cases, disease in the antrum can be traced to the irritation from decayed teeth, or to the rude and unskilful efforts of dental surgery. In a case which occurred to Mr. Luke, at the London Hospital, a fibrous tumor, filling the antrum, originated in the alveolar process, and within the base of the tumor, a black carious tooth was imbedded*; and, in other instances, the origin of the tumor in the antrum in some source of irritation connected with the teeth, was probable, from its being attached only to the lower and front wall of the antrum, where are the sockets of the molar and bicuspid teeth. Further, it is to be observed, that morbid growths mostly arise from either of the lateral parts, not from the front of the jaw; a fact which might be explained by the consideration that irritation more frequently

* Plate 16, fig. 8.

originates in a molar than in an incisor tooth. A similar view of the origin of diseases in the antrum is set forth by M. Bordenave, in his Memoir on this subject*. Occasionally, however, these diseases do occur independently of sources of irritation connected with the teeth. In India, the natives are remarkable for the soundness of their teeth, yet they are subject to morbid growths from the jaws, of the same character with those which occur in this country†.

Morbid growths in the antrum have, in some cases, commenced in early life; in others, at an advanced age. In one case which I saw, the disease commenced at the age of four years. In a case recorded by M. Gensoul, a morbid growth commenced in the antrum of a woman in her fifty-ninth year‡; and I have seen a case wherein a morbid growth, filling the antrum, and causing the expansion of its walls, commenced in a female seventy-six years of age.

Morbid growths from the superior maxillary bone, are of a fibrous, cartilaginous, encephaloid, fatty§, erectile, or osseous nature.

The osseous growths from the superior maxillary bone are, in some instances, combined with hypertrophy of the surrounding bones, producing a general enlargement of them. The cartilaginous tumors are the most favourable for removal; not only because they present more of the characters of local affections, and do not contaminate the adjacent absorbent glands, or deteriorate the general health; but especially, for the reason, tnat they are usually of a globular form, do not extend irregularly into the adjacent parts, and, in consequence, can be removed with the certainty of taking away the whole of the morbid structure. In the first case in which M. Gensoul removed the superior maxillary bone, a fibro-cartilaginous tumor, of the size of the closed hand, originated in the antrum. It was globular, had an even surface, a well-defined outline, and loose cellular connexions with the adjacent parts||. The encephaloid, and fatty tumors, on the contrary, are much less favourable for operation, as the morbid deposit is apt to

* "La carie des dents est la cause de presque toutes les maladies du sinus maxillaire et de celles qui affectent les parties circonvoisines." Précis d'observations sur les maladies du sinus maxillaire, par M. Bordenave, Mem. de l'Academie Royale de Chirurgie, t. xii. 12mo.

† On diseases of the Jaws, by Richard O'Shaughnessy. Calcutta, 1844.

‡ Lettre chirurgicale sur quelques maladies graves du sinus maxillaire, et de l'os maxillaire inferieure. Paris, 1833.

§ Composed of granules of a greasy substance, of the character of stearine. || Loc. cit.

extend indefinitely among the surrounding parts, so that it is difficult, often impossible, to effect its complete removal. Even an osseous exostosis, growing from the walls of the antrum into its cavity, may not be a well-defined disease, as it may be combined with hypertrophy of the bones of the face and cranium. An erectile tumor growing from the antrum, is a rare form of disease; it occurred to M. Gensoul in one of the cases wherein he successfully removed the superior maxillary bone. The tumor was soft and vascular, and quicksilver impelled into the morbid structure readily pervaded it throughout*.

In completion of the view of the diseases which originate in the antrum, it should be observed, that there is a class of cases, apparently commencing in collections of fluid within the antrum, but followed by malignant ulceration of its walls; not, however, accompanied by any morbid deposit, and, therefore, not presenting, in any stage, the characters of a distinct tumor.

Instances have occurred wherein the disease designated epulis, originating in the gum, thence extended through the socket of a molar tooth into the antrum, in which, consequently, the disease was supposed to have originated. Such were the circumstances of the following case. In a man, thirty years of age, a tumor projected into the mouth from the back part of the alveolar border of the upper jaw; it was firm and noduled on its surface. The painful state of the whole side of the face, combined with a projection of the front wall of the antrum, were considered to indicate that the disease had originated within it. Two attempts were made to scoop out the morbid structure through the alveolar border of the jaw, by breaking away the partitions between the sockets of the molar teeth; but, after each operation, the disease was rapidly reproduced. So much constitutional derangement followed these operations, that the man's health declined, and he sank. On examining the seat of the disease, it was found that the morbid structure originated in the gum; and that, although it completely filled the antrum, it had no connexion with its walls: the membrane lining the antrum was healthy.

Much care is requisite in the diagnosis between enlargement of the antrum, by a morbid growth within it, and the expansion of its walls

* Loc. cit.

by fluid accumulated in its cavity. When the enlargement of the antrum is accompanied by a thinning of its front wall, the swelling may yield to pressure, and communicate to the fingers a peculiar crepitating sensation. But the enlargement of the cavity of the antrum is, in some instances, accompanied by hypertrophy of its walls, giving to the tumor the characters of a solid mass of bone. The following case of this kind occurred in St. Bartholomew's Hospital, under the care of Mr. Lawrence. A woman, aged twenty-four, was admitted, with a large, hard, round swelling of the cheek, in the situation of the antrum; it was free from pain, and the soft parts covering it were healthy: such was the solidity, and the hardness of the swelling, that it was supposed it might be an osseous growth from the antrum; and the history appeared to confirm this view of its nature, as the woman stated, that, about five months previously, she received a blow on the cheek, and that soon afterwards, the swelling commenced, and had slowly increased to its present magnitude, which was about that of a middle-sized orange. A scalpel was thrust into the tumor, immediately above the sockets of the molar teeth, and healthy pus flowed from the opening; the discharge continued, in gradually decreasing quantity, and the swelling subsided as the walls of the antrum receded to their natural limits.

One such case as the foregoing indicates the propriety of not commencing the extirpation of a tumor of the antrum, without previously plunging an instrument into it, to be certain of its solidity. The following case, recorded by M. Gensoul, affords a further illustration of this point. A child, thirteen years of age, had a large tumor in the cheek; the arch of the palate was depressed, the nostril closed, and the nose pushed to the opposite side of the face. It was determined to remove the superior maxillary bone. The incisions in the soft parts had been made, when it occurred to M. Gensoul to pass an instrument into the tumor before dividing the bone. A yellow fluid escaped from the antrum, and, on freely opening its cavity, this was found greatly enlarged, and its lining membrane of a red colour, but not otherwise altered. On passing a finger into the antrum, the canine tooth was found lying in the bottom of the cavity, and adhering to its walls. The operation was here concluded. M. Gensoul expresses his hope, that the candid avowal of his error in the diagnosis of this case, will have the effect of directing the attention of surgeons to the various sources of these swellings, and that, before deciding upon their removal, they

will carefully examine them, and particularly ascertain that the process of dentition has been completed*.

A tumor gradually increasing within the antrum may occasion the yielding of its walls, equally and in all directions. By the yielding of its front wall, a round prominence will gradually advance into the cheek; by the yielding of its inner wall, and of the septum nasi, the nostril will become closed, and the nose pushed to the opposite side; by the yielding of its upper wall, the tumor extending into the orbit will displace the eye forwards, and probably upwards and outwards; and, lastly, by the yielding of the palate, the tumor will project into the mouth. But, in some cases, the disease extends chiefly in one direction; and, under such circumstances, the diagnosis of it will probably be difficult. In a case which I saw, where a morbid growth originating within the antrum, had extended only in the direction of the nostril, portions of it had been extracted by the polypus-forceps, under the supposition that it grew from the pituitary membrane; and there is a case recorded, wherein an operation having been commenced for the removal of an osseous tumor, which projected into the orbit, and was supposed to have originated in its walls, it was discovered that the tumor extended into the antrum, and, consequently, only the portion within the orbit was removed†.

In investigating the connexions of a tumor originating in the antrum, a probe should be passed along the floor of the nostril, to learn the extent of it in this direction, and the finger should be turned around the posterior border of the soft palate to its upper surface, to ascertain if any part of the tumor can be here recognized. But, even with the help of the most careful examination, whenever the disease fills the antrum and the nostril, it will be uncertain whether or not it extends posteriorly beyond the front surface of the pterygoid process of the sphenoid bone. If it does so, it will be beyond the reach of any incisions that can safely be made for its removal, and, accordingly, in operations which I have witnessed, where the whole of the diseased structure was not removed, it had penetrated the pterygoid process, or had encroached upon the lateral borders of this process, or it had extended upwards towards the basis of the skull.

The question of an operation in these cases mainly rests on the state of the general health, on the extent and connexions of the disease, and

* Loc. cit.

† Encyclographie des Sciences Médicales, Novembre, 1834.

on the condition of the parts around it. The circumstances of the case considered to be fit for operation, ought to be such as to afford the fullest ground for believing that the incisions can be made through healthy parts, beyond the limits of the disease. In no case can it be justifiable to return to the ancient methods of scooping out, or in other ways extracting part of the morbid structure, and trusting to caustics for the destruction of the remainder. To M. Bordenave the merit is due of originally suggesting sound views of the nature and treatment of these diseases. He insisted on the propriety of not undertaking an operation, when there was uncertainty respecting the possibility of taking away the whole of the disease; and he has related several instances of permanent cure, after the extraction of tumors from the antrum*. But, to Mr. Lizars, of Edinburgh, the merit is due, of showing that the only satisfactory mode of treating these cases is by the removal of the entire superior maxillary bone, and of explaining the proceedings for its accomplishment†. Mr. Lizars is, therefore, to be regarded as the originator of this operation, the propriety of performing which, in certain cases, is abundantly proved by the experience of modern times. To Mr. Liston we are indebted for a discrimination of the cases in which the operation may with propriety be undertaken‡. Further, in the memoir of M. Gensoul, there are valuable records of experience on this subject.

OPERATIONS UPON THE SUPERIOR MAXILLARY BONE.

One consideration, it has appeared to me, belongs to all operations performed for the removal of either a portion, or the whole of the superior maxillary bone; namely, that they are cases in which a serious objection lies against the use of either chloroform or æther; for, inasmuch as by the influence of these agents in annihilating sensibility, the irritability of the glottis is weakened, if not wholly lost, so there must be danger of a trickling of blood from the mouth of the glottis, without the excitement of a cough to expel it from the windpipe. It is true, that the amount of this danger is but small; but, in my mind, it is sufficient to know that the apprehended evil has once occurred: severe as the pain of these operations may be, it had better be endured than the risk of suffocation incurred, which must be regarded as a pos-

* Loc. cit.

† A system of Anatomical Plates, Part IX. Organs of Sense, 1826.

‡ On Tumors of the Mouth and Jaws, Medico-Chirurgical Transactions, Vol. xx.

sible occurrence, from the filling of the pulmonary air-tubes and cells with blood.

OPENING THE ANTRUM FOR THE EXTRACTION OF A MORBID GROWTH FROM ITS CAVITY.

For the extraction of a morbid growth from the cavity of the antrum, a wide opening into it is requisite, and this can be obtained in no other way than by removing part of its front wall. Formerly, for this object, a trephine or perforator was applied to the alveolar border of the jaw; but the opening into the antrum thus made will be insufficient for obtaining a full view of its cavity. Bordenave assigns the merit of first proposing the perforation of the front wall of the antrum to M. Lamorier, of Montpellier. His directions for the operation are such as surgeons at the present time adopt—to divide the gum and periosteum, immediately above the socket of the first molar tooth, then, with a perforator, to penetrate the bone, and afterwards to enlarge the opening to the requisite extent.

For the removal of the whole front wall of the antrum, it is necessary to reflect from it, the integuments and muscles of the cheek. The incision of the integuments for this purpose should extend from the inner corner of the orbit vertically downwards, by the side of the nose and through the upper lip. Next, the mucous membrane is to be divided horizontally, in the line of its reflexion from the cheek to the gum, and then the flap, formed by the integuments and muscles of the cheek, is to be detached from the bone, and turned upwards to the margin of the orbit. It has been recommended, that the flap of integuments and muscles should be formed by an incision, extending from the prominence of the os malæ, in a curved line with the convexity downwards to the angle of the mouth. But, to this line of incision, there is the objection, that it will include the principal branches of the portio dura. Attention is required to the point, of taking away any portion of the wall of the antrum that is unsound. As the morbid growth frequently originates in the lower and front part of the antrum, along the line of the alveolar process, it may be necessary to remove part of this process. Mr. O'Shaughnessy has related a case, in which he removed the anterior wall of the antrum, and, with it, a fibro-cartilaginous tumor filling its cavity, and there was no recurrence of the disease*.

* Loc. cit.

REMOVAL OF THE SUPERIOR MAXILLARY BONE.

The following considerations should be present in the mind of the surgeon, when deciding on the question of the removal of part, or the whole, of the superior maxillary bone.

The yielding or enlargement of the bony wall of the antrum towards the cheek, orbit, or mouth, is the evidence of its cavity being filled by a solid or fluid morbid product. If its wall has yielded only towards the cheek, its cavity may be filled only by fluid; or if it be filled by a solid substance, this may have arisen in the gum, and extended through the alveolus of a tooth into the antrum; or it may have grown from a small portion of the wall of the antrum, and this will most probably be in the direction of the alveolar process, in which case it will be sufficient to take out the morbid growth from the inside of the antrum, and remove with it the portion of the alveolar process from which it has arisen.

When the disease consists in hypertrophy of the maxillary bone, it may happen, as in the instance which will presently be related, that, in the most careful investigation of the case, no other enlargement of the bone can be discovered than that of its nasal portion, occasioning a prominence at the inner corner of the orbit, and a projection into the nostril; yet, the osseous growth may have completely filled the antrum, and extended through every other part of the maxillary bone. Again, it should be remembered, that this particular disease, namely, hypertrophy, is very apt not only to pervade the entire maxillary bone, but, besides, to extend into the adjacent bones of the same side of the face, and into the bones of the opposite side: of this there are examples in the museums of the College of Surgeons and of St. Bartholomew's Hospital.

A yielding or enlargement of the walls of the antrum, in one or other direction, is the indication of its cavity being filled by a morbid growth. But this indication may be wanting. In the museum of St. Bartholomew's Hospital there is an example of osseous exostosis filling both the antra, without yielding of the walls, or enlargement of either cavity.

Such are the considerations which the surgeon should bring to the question, whether, in the case before him, a portion, or the whole, of the superior maxillary bone ought to be removed. And this is really no mean question, for it will, indeed, be an immense gain to the com-

fort of the patient, if the circumstances of the case will allow the removal of part of the maxillary bone in a direction not to interfere with its palatine and alveolar processes, and thereby not to extend the incisions and removal of parts into the cavity of the mouth; or, if the upper wall of the antrum can safely be left, so as not to interfere with the orbit.

When the disease is limited to the nasal portion of the maxillary bone, the incision of the soft parts for its removal should be made along the bridge of the nose and through the middle of the upper lip. Then, by dividing the mucous membrane, along the line of its reflexion, from the cheek to the gum, and detaching the muscles from the bone, a flap of integument, comprising half the nose, half the upper lip, with the cheek, can be turned upwards to the margin of the orbit, giving the operator a full view of the interior of the nostril, and of the front surface of the maxillary bone.

When, from the extent of the disease, it is necessary to remove the entire maxillary bone, the vertical incision, either along the bridge of the nose, or by the side of the nose, through its ala and the upper lip, will be insufficient. A second incision will be necessary, extending from the corner of the mouth, upwards and outwards, to the prominence of the os malæ. This incision will be requisite for the division of the os malæ, in the line where generally it should be made, immediately behind the suture uniting it to the maxillary bone; and, in instances where the disease extends into the os malæ, this incision must be continued horizontally outwards upon the zygoma, in order that the division of the os malæ may be made where it is perfectly sound.

The following is another plan of the incisions for the removal of the superior maxillary bone, which, in particular cases, might be preferred. The vertical incision being first made by the side of the nose, and through the upper lip, a second incision is to extend from the lower edge of the ala nasi, obliquely upwards and outwards, in a line towards the middle of the cartilage of the ear, and to within about an inch of it. From the termination of this incision, a third is to extend directly upwards upon the zygoma.

After the incisions of the integuments, the mucous membrane is to be divided horizontally in the line of its reflexion, from the cheek to the gum; and the muscles, with the surrounding fat, are to be detached from the front of the maxillary bone, in doing which, the infra-orbitar nerve will be divided at its exit from its foramen. The flap being turned upwards to the margin of the orbit, the contents of the

orbit are then to be separated from its floor, and here the infra-orbitar nerve will be again divided just before its entrance into its canal, and the inferior oblique muscle of the eye will be divided at its origin. Inattention to the complete division of the muscle would lead to its dragging upon the eye, when the maxillary bone is disturbed from its position.

The principal incisions of the soft parts being completed, the divisions of the osseous connexions of the maxillary bone is then to be effected.

First, the os malæ is to be divided close to the suture uniting it to the maxillary bone, or further backwards if the disease extends into the os malæ; but, in either case, the division of the bone should be continued to the spheno-maxillary fissure; for, unless this is done, the connexion of the maxillary bone will still be firm in this direction.

Next, the alveolar process is to be divided through the socket of the front incisor tooth, which should be previously extracted, and the palate is then to be divided close to the septum nasi, along the middle palatine suture; and, unless it be impracticable from the extent of the disease, the palate should be divided transversely along the suture uniting the maxillary to the palate bone, thereby preserving entire the attachment of the soft palate. Previous to these divisions of the palate with the saw or cutting forceps, the palatine membrane should be divided with a scalpel.

Lastly, the ascending portion of the maxillary bone is to be divided in a line extending from the upper part of the nostril to the inner corner of the orbit, thereby detaching the maxillary bone from the os nasi and from the internal angular process of the frontal bone.

After the division of these several portions of bone, the principal remaining connexions of the maxillary bone will be at its back part with the pterygoid process of the sphenoid bone and with the soft palate. The depression of the tumor, with, if necessary, some jerking movements of it, will loosen the connexion of the maxillary bone with the pterygoid process, and enable the operator to dislocate it, as it were, from its position; and, in doing this, the orbitar plate of the maxillary bone will be detached from the os planum of the ethmoid. The only remaining connexion of the maxillary bone requiring division will be that with the soft palate; and this must be carefully effected with the scalpel, especially if it has been found necessary to remove the entire bony arch of the palate, in order that the soft palate may be injured as little as possible in separating it from the palate bone.

The several divisions of the maxillary bone require to be executed with the saw, cutting forceps, or strong scissors. Portions of bone which are readily divided with the scissors in early life, require the application of the saw in the adult.

During the operation, the patient should be in the sitting posture, reclining but little, in order that the blood may escape through the outward wound, and not descend into the pharynx.

The amount of hæmorrhage from the parts divided in the operation, is not in general considerable. The internal maxillary artery often becomes obliterated during the progress of the disease in the jaw; if it should be open, the hæmorrhage from it may be so profuse as to require the compression of the carotid. Usually, but few vessels require ligature. At all events, the preliminary step of tying the external or common carotid is unnecessary. If much blood should flow from parts so deeply situated, that the divided vessels cannot be reached with ligatures, the measures then to be taken are the maintenance of firm pressure for some time against the bleeding surface with dry lint, or with lint soaked in a saturated solution of alum; and, if these fail, it might be deemed expedient to use the actual cautery.

It has been considered necessary to fill the cavity of the wound with lint, for the support of the eye, and to prevent the cheek sinking inwards; this, however, was not done, in the cases which I have witnessed, and apparently no disadvantage ensued. Many fine sutures and thin pins are to be employed in maintaining the divided edges of the integuments in accurate contact; and, over these, strips of isinglass plaster are to be placed.

If, in the removal of the maxillary bone, a portion of the parotid duct should be taken away, no salivary fistula may ensue, a new passage being formed for the saliva into the mouth. In removing a carcinomatous tumor of the cheek, I took away, as it was implicated in the disease, half an inch of the terminal portion of the parotid duct; yet no salivary fistula ensued: and, in the case of a nævus occupying the entire cheek, with the exception of the integuments, I removed the whole of the parotid duct to within half an inch of the gland; yet there was afterwards no salivary fistula, and no evidence of obstruction to the flow of the saliva into the mouth.

The loss of the maxillary bone is followed by a less amount of discomfort and inconvenience than might be expected. Provided that the soft palate has been left entire, there will be but little impairment in the power of swallowing; and articulation will be distinct, though

with a change in the tone of the voice, from the loss of part of the bony arch of the palate. Mechanical contrivances may, in some degree, remedy this; when but a small part of the arch of the palate has been removed, the adjustment of a silver plate, fixed with a sponge introduced into the opening, has, in some instances, restored to the voice its natural tone.

The removal of the maxillary bone has been, in some instances, directly fatal, apparently from the shock it occasioned to the system; but there have been, I believe, more instances of its fatality, from erysipelas of the head and face, appearing after the healing of the divided edges of the integuments, but before the reparation of the large wound in the deeper parts of the face. It was my misfortune to have a case in the hospital which terminated unfavourably from this cause; and I relate it, because there were circumstances of practical interest in it, with respect to the nature and diagnosis of the disease, and the operation performed for its removal.

Hypertrophy of the Superior Maxillary Bone; removal. A girl, fifteen years of age, was admitted into St. Bartholomew's Hospital, with an oblong, hard, and painless enlargement of the nasal portion of the superior maxillary bone, projecting into the face and extending into the nostril: no disease was discoverable in the adjacent parts; there was neither prominence of the cheek, nor displacement of the eye, nor projection of the palate. The patient and her father stated that the disease had been eight years in progress, and that it was still increasing. Her health was perfectly good. After she had been a few weeks in the hospital, it was evident that the swelling had increased since her admission, and, consequently, it became necessary to determine, if possible, the nature and extent of the disease, in reference to the question of removing it by operation. The characters of the swelling indicated it to consist of solid osseous substance; and from the extension of the disease into the nostril, I regarded the case as an instance of hypertrophy of the maxillary bone; but it was difficult to determine the boundaries of the disease. There were no signs of its extension beyond the nasal portion of the bone; but knowing the disposition of hypertrophy of bone to spread widely and indefinitely, and knowing, besides, that although there was no enlargement of the antrum, it might nevertheless be filled by osseous substance, I could not feel certain of the extent of the disease, and, consequently, was unable to decide beforehand how much of the maxillary bone ought to be removed.

In consultation, the removal of the diseased bone was agreed to be

a right measure: but I was compelled to proceed to the operation with uncertainty on the two material points—the nature and extent of the disease. It was hinted to me that the swelling might be an osseous cyst, with thick sides; this did not seem probable, as cysts are not apt to form in this part of the maxillary bone. However, to learn the nature of the disease, I commenced the operation by making a small incision of the integuments covering the most prominent part of the tumor, and then penetrated it with a perforator, by which I satisfied myself that the tumor consisted of solid bone. Then, in the supposition that only the nasal portion of the maxillary bone might require removal, I made an incision along the bridge of the nose, in its whole length, and through the middle of the upper lip, and turned upwards the flap thus formed, comprising the ala nasi, and half the upper lip, with the cheek. My next object was to ascertain the condition of the antrum, and, accordingly, I perforated its front wall, by which I satisfied myself that its cavity was filled by solid bone. Under these circumstances, there could be no hesitation respecting the necessity of removing the entire maxillary bone, which was accomplished with the aid of a second incision of the integuments, extending from the corner of the mouth to the prominence of the os malæ.

The hæmorrhage, during the operation and after it, was only from small arteries, which were readily secured.

Scarcely any constitutional disturbance followed the operation. On the fourth day after it the pins and sutures being removed, the incisions of the integuments through their whole extent were found to be perfectly united. On the sixth day, erysipelas appeared in the opposite side of the face, and gradually spread upon the head and neck. Every effort was made to sustain the vital powers, but the erysipelatous skin became of a dusky red colour, and the circulation gradually sinking, the patient died on the tenth day from the operation.

The part which had been removed comprised the entire superior maxillary bone, with the palatine portion of the palate bone, from which the soft palate had been carefully detached. The disease was hypertrophy of the maxillary bone, pervading every part of it, and producing complete obliteration of the cavity of the antrum. Accordingly, the diseased part, when divided with a saw, presented no other character than that of a solid mass of bone.

OF MEMBRANOUS CYSTS, CONNECTED WITH THE ALVEOLAR PROCESS OF THE UPPER JAW.

Membranous cysts, apparently growing from the fangs of the teeth, are formed within the upper jaw, just above the alveolar process. These cysts, in enlarging, cause either an expansion and thinning of the walls of the bone, or the absorption of its outer wall, so as to appear on the outside of the jaw; and in either case, the tumor projecting in the cheek, or into the mouth, may resemble the enlargement of the antrum. Delpech relates an instance of this kind, in which the tumor was opened, and three ounces of fluid discharged from it. But he observed that the inside of the cavity, which contained the fluid, bore no resemblance to the inside of the antrum, and, accordingly, concluded it was an instance of a membranous cyst developed in the bone*. The following case, of the same kind, occurred, under the care of Mr. Lawrence, in St. Bartholomew's Hospital. A man, aged thirty-two, was admitted with a tumor in the face, which projected in the situation of the front wall of the antrum; also downwards, between the cheek and the alveolar process, pushing the mucous membrane before it. A puncture was made into it, between the cheek and the jaw, when about a table-spoonful of glairy fluid, with solid shining particles floating in it, was discharged. A probe, introduced into the opening, could be moved freely in the cavity from which the fluid flowed; but it was doubtful whether this was the interior of the antrum, or a cavity contiguous to it. The tumor subsided, and there appeared to be no re-accumulation of fluid in it.

The membrane, composing these cysts, is thick, of a white colour, and somewhat villous on its free surface. Their contents are either a fluid, thin, serous, and colourless, or sanguineous, or thick and mucilaginous, or a solid but soft and yellow substance; and, in some instances, shining, spermaceti-like particles, are mixed with the fluid contents of the cyst. Generally there is only one cyst; occasionally there are several. The cyst, in some cases, remains stationary while still of small size; but in others, it increases, and it has acquired the dimensions of a large orange.

* Elle ne présentait dans le bas, rien de comparable à la rainure large que l'on appelle la paroi inférieure du sinus maxillaire, rien en haut, qui répondit au plancher de l'orbite, rien en dedans, qui peut être pris pour la paroi interne du sinus. Il est évident qu'un kyste sero-muqueux s'est développé dans l'épaisseur de la paroi inférieure du sinus maxillaire.—Delpech, Chirurgie Clinique de Montpellier.

These membranous cysts are generally formed in early life, but occasionally at a later period. In some cases they are apparently the consequence of external injury, but, in general, they appear to have been consequent on the irritation of a carious, or misplaced tooth. And, from the observations which have been made on this subject, it appears probable that the development of the membranous cyst commences either close to, or actually within, the socket of a tooth, and near to the extremity of the fang. With reference to this point, Delpech states, that he has witnessed cases where a sound tooth, being extracted on account of severe pain in it, a small membranous sac, containing a fluid, was found connected with the vessels and nerve of the tooth, at the extremity of its fang; this sac having been lodged in a cavity of the bone at the bottom of the alveolus*. It may be doubted, however, whether these were not instances of abscess formed at the root of the tooth.

When the membranous cyst, as it enlarges, causes an expansion of the bone, accompanied by the thinning of its walls, an osseous cyst is formed, the sides of which, being thin, readily yield to compression, and recoil, by their elasticity, with the peculiar crackling, or crepitating sensation which generally belongs to osseous cysts with thin parietes, whether of new formation, or resulting from the expansion of the walls of the bone.

In the treatment of these membranous cysts in the upper jaw, one or other of the following measures is to be preferred, according to the circumstances of the case,—the puncture of the swelling to ascertain the nature of its contents,—a free incision into the cyst, or the removal of a portion of it, that there may be a free outlet for its contents, —the injection of an astringent, or stimulant liquid, into the cyst, which will alter the character of its secretion, or which may induce suppuration within it, followed by the gradual contraction of it,—the application of escharotics to the inside of the cyst, which will destroy its lining membrane, and may be followed by the production of granulations from the inside of the cavity in the bone to the extent of completely filling it†. In some instances, even where the cyst is large, the measure of affording a constant and free outlet for its contents is sufficient, the cavity in the bone then becoming obliterated, and its expand-

* Loc. cit.

† Cases of the membranous cyst within the jaw, which were successfully treated by the above measures, are reported in the Leçons Orales of M. Dupuytren, t. iii.; also by Mr. Syme, Clinical Report, Edinburgh Surg. Journ., July, 1835.

ed walls returning to their natural condition. A sufficient opening into the cyst, for the free discharge of its contents, has been obtained by the extraction of a tooth and the perforation of the bottom of its socket. The opening into the cyst should always be made from the inside of the mouth.

TREATMENT OF ACCUMULATIONS OF FLUID WITHIN THE ANTRUM.

The character of the fluid, which, under different circumstances, is accumulated within the antrum, varies; it may be puriform, or thin and serous, transparent, and of a yellow colour; or it may have the characters of glairy mucus. Suppuration in the antrum may be the consequence of a blow on the cheek, but its more frequent cause is the irritation of a decayed molar, or bicuspid, tooth; occasionally, however, it has arisen without obvious cause. The best evidence of suppuration within the antrum, in addition to the uneasiness and tenderness in the cheek and adjacent parts, is the flow of matter into the nose, or through the socket of a recently-extracted tooth.

The treatment of suppuration in the antrum consists in the formation and maintenance of a dependent opening in the cavity, and in occasionally syringing it with tepid water. A small metallic syringe, with its pipe a little curved, is well suited for this purpose. The dependent opening is conveniently made through the socket of a molar, or bicuspid, tooth. If the extraction of a tooth is necessary, the first or second molar should be preferred. But the opening into the antrum can be as well made by the perforation of its front wall. Having divided the mucous membrane and periosteum, just above the first or second molar tooth, the wall of the antrum may then be easily perforated; and the aperture should be large, that the matter may readily escape through it, and that it may not speedily close. In perforating the front wall of the antrum, the other points of attention are, to make sufficient allowance for the depth of the alveolar process, which varies, and to direct the perforation obliquely upwards and inwards, that it may enter the cavity fairly above its lower boundary. If the opening in the antrum should appear to be closing before the secretion of matter into it has ceased, a tent of linen, or lint, or a piece of an elastic gum catheter, should be introduced into it. The following cases, related in the Memoir of Bordenave*, are good illustrations of the subject; they are interesting besides, as showing the perfect knowledge he pos-

* Loc. cit.

sessed of the nature and treatment of these diseases: indeed, to his observations, recorded a century ago, but little importance has been added in modern times.

"A young woman had a swelling on the cheek, preceded by acute pain, extending to the orbit, attended with a sense of heat and throbbing in the part. These symptoms determined Bordenave to extract the third molar tooth*, and perforate the bottom of its socket. A large quantity of matter was discharged. The cavity of the antrum was injected, the swelling of the cheek subsided, and in six months the patient was perfectly well. A child, twelve years of age, had caries of the first molar [bicuspid] tooth, and swelling of the cheek ensued. An accumulation of fluid in the antrum, from the irritation of the decayed tooth, was suspected. The tooth was extracted, and a large quantity of a yellow, watery fluid immediately escaped from the socket. The swelling of the cheek immediately subsided, and the patient, in a short time, was perfectly well."

Cases are also related by Bordenave, of suppuration in the antrum, followed by ulceration of its front wall, and the formation of fistulous passages in the cheek, on account of which it became necessary to extract one or two of the molar teeth, to obtain the constant discharge of the matter through the dependent opening. The fistulous openings in the cheek immediately closed. When the passage from the socket of a tooth into the antrum was disposed to close, before the suppuration in its cavity had ceased, Bordenave advised the patient to keep a silver canula in the opening.

* The first molar in the modern classification of the teeth.

CHAPTER II.

DISEASES OF THE BONES OF THE SPINE.

It would be of little practical utility to consider the diseases of the bones of the spine apart from those of their appendant structures, the fibro-cartilages, ligaments, and periosteum; accordingly, the subject of the following section will be the diseases of the entire vertebral column.

Some of the diseases of the spine are of an inflammatory nature, simple or rheumatic; others are of a scrofulous character, and combined with the deposition of tubercle in the bones and fibro-cartilages. There, also, occur in the spine, the malignant diseases carcinoma, encephaloma, melanosis.

The following structural changes from inflammation occur in the spine—thickening of the periosteum and ligaments; suppuration beneath the periosteum, also within the bones; ulceration, hardening, and necrosis of the bones; softening and ulceration of the fibro-cartilages.

Mechanical injury—such as a blow on the spine, or a sudden and forcible movement of the trunk wrenching the spinal ligaments,—or some special exposure of the body to cold and moisture, comprise the most frequent causes of inflammation in the coverings of the spine. Occasionally the spinal affection is associated with inflammation in one or more of the larger joints in the limbs. And, in some of these cases, paraplegia ensues by extension of the inflammatory action from the coverings of the spine to the spinal cord and its nerves, or by thickening of the posterior vertebral ligament, whereby the spinal canal is narrowed to the degree of compressing the cord*.

More acute inflammation in the fibrous coverings of the spine occa-

* C. A. Key, in Guy's Hospital Reports, Vol. iii.

sions suppuration between the periosteum and the bones, and these cases are to be regarded as analogous to those of acute periostitis upon other bones. The following is a well-marked history of such a form of spinal disease.

Suppuration beneath the coverings of the Spine. A healthy man, forty-five years of age, was exposed to frost and snow through a long winter's night. A few days afterwards he was attacked with smarting pain in his back, a sensation he said like that of boiling water flowing over the skin. This lasted a fortnight, and was followed by a more severe pain, making him feel as if he was lying on sharp cutting flints. These were the symptoms preceding suppuration between the spine and its coverings. The pain gradually subsided, and was succeeded by slowly-increasing paraplegia. In about fourteen months from the commencement of the disease he died. On examining the spine, I found a large quantity of purulent fluid between the periosteum and the bodies of the fifth, sixth, and seventh dorsal vertebræ. The purulent fluid accumulated upon the posterior surfaces of these vertebræ, although confined by the periosteum and posterior vertebral ligament, yet projected into the spinal canal sufficiently to compress the cord. The surfaces of the vertebræ, with which the purulent fluid had been in contact, were roughened, and their fibro-cartilages had disappeared*.

I have known instances where, in the course of fever, acute inflammation has arisen in the bones of the spine, occasioning excessive vascularity of their cancellous texture, with destruction of the fibro-cartilages, apparently by mortification and sloughing of their tissue.

Purulent fluid is often found diffused through the cancellous texture of the vertebræ; but I have not known any certain example of circumscribed abscess in a vertebra similar to that which occurs within the articular ends of long bones. There is, however, in the museum of St. Bartholomew's Hospital, a lumbar vertebra, hollowed out in the centre of its body into a round cavity, which communicates by a small opening with the spinal canal. It is not unlikely, that this vertebra had been the seat of circumscribed abscess, which burst into the spinal ca-

* Louis has recorded cases in which impaired motion and sensation in the limbs ensued from compression of the cord by purulent fluid accumulated within its bony canal. Mémoires ou Recherches Anatomico-Pathologiques—De l'état de la moelle épinale dans la carie vertébrale.

nal just as the abscess within the articular end of a bone often bursts into the adjacent joint.

Ulceration of the bones of the spine is the most frequent of their structural changes; and, in some instances, hardening of the inflamed bone precedes its ulceration. Ulceration occurs most frequently in the bodies of the vertebræ; occasionally it attacks their arches and processes. In some instances, ulceration appears to have attacked many vertebræ, and, in others, several parts of a vertebra at the same time.

Mechanical injury is probably the most frequent cause of ulceration of the vertebræ. The following are instances of its occurrence from this cause.

Ulceration of the Vertebræ from injury. A man fell on his back into the hold of a ship. Severe pain ensued in the lower part of the spine, with feebleness of the lower limbs. Seven months afterwards he died. On examining the spine, I found numerous ulcerated cavities in the bodies of the twelfth dorsal, and of all the lumbar vertebræ, with much serum in the theca of the cord.

Ulceration of the Vertebræ from injury. A middle-aged man, whilst holding a ladder which he had raised from the ground, was turned sharply round by a gust of wind. From that instant he felt pain in his back, which continued; and, in the course of the following six months, angular projection of the spinous processes of the middle dorsal vertebræ ensued, with complete loss of motion and sensation in the lower limbs. He gradually sank. On examining the spine, I found the bodies of three of the dorsal vertebræ extensively ulcerated, and a detached piece of the middle of these vertebræ displaced backwards into the spinal canal, and compressing the cord.

Ulceration of the vertebræ is, in most instances, accompanied by fixed pain in the diseased part; but occasionally it is otherwise, and then the disease advances without signs of its existence, until it is made evident, either by the distortion consequent on the destruction of the bodies, or by some change in the direction of the spinous processes consequent on the destruction of the arches, of the vertebræ.

Ulceration of the bodies of the vertebræ usually commences in their anterior parts, and it rarely extends completely through them. But even upon this incomplete destruction of the bodies of the vertebræ, paraplegia occasionally ensues of the worst kind, as it is caused by compression of the spinal cord. The following is the mode of its occurrence. After the destruction of the front parts of the bodies of a

certain number of the vertebræ, the healthy vertebral bodies bounding the seat of the disease, gradually approximate, and, in doing so, they force backwards the posterior parts of the bodies of the ulcerated vertebræ; thus the spinal canal becomes narrowed and the cord compressed; or, as in the case just related, a detached piece of the diseased bone, forced backwards into the spinal canal, compresses the cord. With the knowledge of these facts, I have been able to form a definite opinion of the nature of the disease, and of its probable result, in cases where, with unnatural projection of the spinous processes, complete paraplegia occurred at an advanced period; and, in several of these, the examination of the parts after death verified the opinion, showing the disease to have been ulceration of the vertebræ, with displacement of the diseased bone, and compression of the spinal cord.

Ulceration of the vertebræ is reparable only to a limited extent. The ulcerated hollows in the bones become filled with fibro-cellular tissue; but the lost bone is never reproduced, and, accordingly, when the bodies of the vertebræ are extensively ulcerated, the process of cure consists in the approximation and union of the opposite surfaces of the healthy vertebræ bounding the seat of the disease.

It has been a question, whether disease ever commences in the inter-vertebral fibro-cartilages; but it is proved to do so in instances where the fibro-cartilages are found diseased, and the adjacent bones sound. In the body of a young man, from whose thighs two psoas abscesses had long been discharging, I found no trace of either psoas muscle, the place of each muscle being occupied by the cyst of a large abscess; both abscesses communicated above with a space between the bodies of the third and fourth lumbar vertebræ, resulting from the destruction of the intervening fibro-cartilage; but the adjacent bones and the rest of the fibro-cartilages were perfectly sound.

The disease which begins in a fibro-cartilage appears to be inflammatory, occasioning, first, in the softening, and then the splitting of its tissue into shreds; in this way the fibro-cartilage gradually disappears, and, whilst these changes in the fibro-cartilage are in progress, the adjacent bones become affected in a manner to show the inflammatory character of the disease; their cancellous texture becomes hardened, and then it ulcerates. Such, therefore, is the condition in which the vertebral bodies are usually found adjacent to the vacant space between them, resulting from the destruction of a fibro-cartilage.

The disease just described, in many instances, attacks only a single

fibro-cartilage; but it often attacks several of them, and there have been instances of its occurrence through the whole series of the fibro-cartilages, from the second cervical vertebra to the sacrum*. One other circumstance belongs to the history of this disease in the inter-vertebral fibro-cartilages, namely, that it often gives rise to the formation of psoas abscess. It has certainly been so in many instances which I have examined; in some of them there was a single, and in others a double psoas abscess, the two abscesses communicating with the vacant spaces between the vertebral bodies resulting from the destruction of the fibro-cartilages; and, in many of these, only a single fibro-cartilage had been diseased.

There are instances of the deposition of tubercle in the inter-vertebral fibro-cartilages, independent of disease in the bones. In one such case, where the cause of death was the deposit of tubercle in the cerebellum, tubercular deposits were found in several of the lumbar inter-vertebral fibro-cartilages; but there were none in the vertebræ themselves.

Scrofulous disease exhibits the same characters in the bones of the spine that it does in other bones. The vertebræ become soft by diminution of their earthy constituents, and tuberculous matter is diffused through their cells. Whilst these changes are going on in the bones, tuberculous matter is often deposited in large quantity upon the front of the spine, beneath its fibrous coverings; and, in some instances, these coverings yield in such a manner, that the accumulated tuberculous matter forms a solid circumscribed tumor, projecting forwards into the cavity, either of the chest or abdomen. When this tumor is of large size, and projects forwards into the abdomen, it may be felt through the parietes; and I have known instances of its being mistaken for the swelling of enlarged absorbent glands, or of malignant disease.

When the bodies of the vertebræ are softened and their cells filled with tuberculous matter, the reparative process which may ensue consists in the removal of the diseased bones, and in the approximation and union of the healthy vertebræ above and below them. But in consequence of the disease extending through the entire thickness of the vertebral bodies, the subsequent approximation of the healthy

* Museum of St. Bartholomew's Hospital, Fourth series, No. 37, Plate 21, fig. 1

vertebræ, with the accompanying projection of the spinous processes, does not occasion any narrowing of the spinal canal. So far from this being the result, the canal is actually widened by the removal of the posterior parts of the bodies of the diseased vertebræ.

The foregoing facts accord with the progress of the symptoms in scrofulous disease of the spine. Thus, in its early stage, impaired motion and sensation of the limbs often ensue from the irritation of the diseased bones communicated to the spinal cord and its nerves. But, in the more advanced stage, when, from the projection of the spinous processes, it is evident that the bodies of the diseased vertebræ have been removed, yet there is no increase of the paraplegia. Indeed, at this period, the feebleness, twitchings, and painful spasms of the limbs usually subside, the spinal cord suffering no impairment of its functions, as it has become adapted to the bony canal changed in its direction, but widened at the seat of the disease. In these particulars, scrofulous disease of the spine contrasts remarkably with the results of simple ulceration of the bodies of the vertebræ, when, in the advanced stage of the disease, complete and irremediable paraplegia ensues from the compression of the spinal cord by the displaced bones.

It should be known, as it leads to proper caution in the treatment, that scrofulous disease in the spine is apt to recur in the same part of the spine at a distant period after apparent recovery. I have seen cases wherein, several years after the apparently perfect cure of scrofulous disease in the vertebræ, it relapsed; and, in most of these cases, psoas abscess appeared on the occasion of the second attack of disease in the spine.

DISTORTIONS OF THE SPINE ENSUING FROM DISEASE OF THE BONES AND FIBRO-CARTILAGES.

Whatever irregularity or distortion ensues in the spine during or after ulcerative disease, is owing to the mode of its reparation, without reproduction of the bone that has been destroyed. Thus the angular projection of the spinous processes and arches is consequent on the destruction of the bodies of the vertebræ. So the destruction of the arches of the vertebræ is followed by the sinking of their spinous processes. Accordingly, the evidence of disease in the vertebral arches is the occurrence of a depression or hollow in the spine, from the sinking of one or more of the spinous processes, whilst an increase in the inter-spaces of the spinous processes is an indication of the destruction

or yielding of the ligaments which unite them. It must, however, be observed, that irregularities in the length, thickness, figure, or direction of the spinous processes in any region of the spine, are not of themselves, independently of other considerations, sure evidence of disease, as such deviations are occasionally met with in the original conformation of the spine. In the dorsal and lumbar vertebræ more especially, I have seen instances of the spinous processes inclining considerably from their regular line to one or other side. Also, in the cervical vertebræ, I have seen the spinous processes from original formation twisted obliquely to one side.

Destruction of the bodies of the cervical vertebræ, followed by consolidation of the adjacent healthy vertebral bodies, is accompanied by shortening of the neck, with an arched projection of the spinous processes. The head approximated to the shoulders is inclined forwards, and is stiffly held in this position, in consequence of the restraint in the movements of the neck.

Destruction of the bodies of the dorsal vertebræ, followed by consolidation of the adjacent healthy vertebræ, is accompanied by angular projection of the spinous processes. When, however, as sometimes happens, the upper and lower surfaces of the bodies of several dorsal vertebræ are extensively destroyed, this portion of the spine will become bent forwards, with an arching of the spinous processes. There are, also, instances of disease destroying only one side of the bodies of several dorsal vertebræ, occasioning a lateral inclination of this portion of the spine, and thus adding lateral curvature to the angular projection of the spinous processes; and there are cases where ulceration of the vertebral bodies had extended completely through them, but so much more widely and deeply on one side, that the reparative process was accompanied by a lateral angular distortion of this portion of the spine.

It is worthy of note, that after the destruction of so large a portion of the spine as is comprised by the bodies of eight of the dorsal vertebræ, with no reproduction of the lost bone—and notwithstanding the extreme angular distortion which ensues—yet this part of the column may again be made firm and strong, by the osseous union of the opposite surfaces of the adjacent healthy vertebræ, aided by the formation of osseous bridges extending over the front and lateral surfaces of their bodies.

Destruction of a large portion of one or two of the bodies of the lumbar vertebræ, is followed by the angular projection of their spinous

processes; but, from the destruction of a small portion of the bodies of several of the lumbar vertebræ, an arching of their spinous processes ensues.

In instances where a single inter-vertebral fibro-cartilage has been destroyed without disease in the adjacent bones, the reparative process is not accompanied by deformity. The adjacent vertebral bodies do not then approximate, but become firmly connected together, and fixed in their position by bridges of osseous substance extending over their front and lateral surfaces. In one case, even after the destruction of the fibro-cartilages of three dorsal vertebræ, no approximation of the adjacent vertebral bodies ensued; they became firmly fixed by osseous bridges extending over their front and lateral surfaces, and, consequently, there was no perceptible change in the figure of the spine. When a still larger number of inter-vertebral fibro-cartilages is destroyed, the consequent deformity will be an arching of the diseased portion of the spine. The segment of a circle, which the spine then forms, has led to the erroneous supposition of its distortion being an effect of the simple yielding of its ligaments from weakness.

GENERAL REMARKS ON THE SYMPTOMS OF DISEASE IN THE SPINE.

Question of Pain in the Spine, being the evidence of disease in it. The reply of experience will be, that pain in the spine is not sure evidence of disease in it; nor is the absence of pain sufficient proof of the soundness of its structures. The many acknowledged sources of tenderness in the spine forbid the conclusion, in any case, that, independently of other circumstances, it must be the effect of organic disease. And the absence of pain in the spine is no proof of the soundness of structures, since disease is here often observed running its course to destruction of the parts it has attacked without an uneasy feeling in them. But, notwithstanding its always doubtful character, pain in the spine, if persistent, limited to a small district, and not yielding to treatment, is a symptom not to be disregarded. I have known instances of attacks of pain in the lower part of the spine confidently treated as lumbago, which proved to be the precursor of complete and permanent paraplegia, from disease in the spinal cord. And I have, also, known lumbago, which proved to be the accompaniment of destructive disease in the vertebræ.

It is remarkable for how long a time, in some cases, pain will endure in the spine, whether or not accompanied by irritation of the spinal cord

and nerves, before the other symptoms appear, significant of disease in the vertebræ. In one case which I saw, there had been pain in the spine, with intermissions, for ten years, when disease in the vertebræ was at length made evident, by perceptible change in the position of the spinous processes.

Pain limited to a small district of the spine, of the same character as that which belongs to disease in the vertebræ, is often the first, and continuing symptom of disease in the spinal cord; and hence, the obscurity in the diagnosis of these affections is, in some cases, so great, that the treatment throughout is conducted with uncertainty, whether the disease be in the vertebræ, or in the cord.

How much caution should be observed in deciding upon the significance of pain and tenderness in the spine, even when long persistent, and fixed in a small district of it, is to be learned from cases, such as I have known, where the pain in the spine of this character had been, for many months, treated with confidence of success, and by means wholly unsuited to the real nature of the disease, which proved to be an aneurism, making its way through the bodies of the vertebræ.

Here it may be well to advert to the not infrequent instances of scrofulous disease in the spine advanced to the stage of destruction of the softened vertebral bodies, with the accompanying angular projection of the spinous processes, but throughout unattended by a single symptom, local or constitutional, that had given warning of the existence of the disease. It has several times happened to me, as it must have done to others, to be told, that in a child, apparently in perfect health, the discovery had, by accident, been made of a projection of one of the spinous processes, so marked as to permit no doubt on the point of one or more of the softened vertebral bodies being crushed, and, perhaps, wholly removed. It is, moreover, remarkable, how frequently such examples of scrofulous disease in the spine occur in children, whose systems have not been debilitated by any of the infantile diseases, such as measles, or scarlatina, whose position in life, besides, has been such that they have not suffered from deficient food, impure air, or bad clothing; or, indeed, from the operation of any of the causes to which the production of scrofulous disease in the spine is usually ascribed.

Symptoms of Affection of the Spinal Cord and Nerves, ensuing from Disease in the Spine. According to the mode of action of disease in the spine, by irritating the spinal cord, or by compressing the cord to the degree of annihilating its functions, the nervous symptoms

are, twitches, or painful spasms, or numbness, or annihilation of the motive, or sensitive, power, or of both, in the parts receiving the spinal nerves. Mostly the motive power is impaired in a greater degree than sensation, probably from the proximity of the motor nerves and columns of the cord to the vertebral bodies and fibro-cartilages, which are generally the seat of disease.

Other modifications in the nervous affection are occasionally observed; thus the irritation of the spinal cord, instead of taking its usual course downwards, and affecting the parts below the disease, has, in rare cases, travelled upwards, so that disease in the lower dorsal vertebræ has chiefly affected the nerves of the upper limbs. The internal organs, especially of the abdomen and pelvis, variously participate in the nervous derangements ensuing from disease in the spine, and manifest, either a slowness of their action, or an apparent increase of their sensibility; the latter more particularly occurring in the mucous surfaces of the bladder and intestines, which, in some cases, become so susceptible of slight impressions, that the mere touch of the inside of the bladder by a catheter, or the slight stimulation of the intestines by a purgative, will be directly followed by severe spasms in the limbs.

There are cases of disease in the spine, wherein the nervous derangement is wholly manifested in the trunk by the following symptoms:—a sense of tightness and constriction across the upper part of the abdomen, uneasy breathing, a sense of distension in the lower part of the abdomen, with enfeebled action of the intestines, and of the bladder; and so the symptoms have continued for months before the appearance of direct evidence of disease in the spine.

In some cases, the impaired nervous functions in the limbs had existed for many months before the evidence arose of their being caused by disease in the spine. In one such case which I saw, feebleness, with cramps and twitches in the lower limbs, had endured for eighteen months before the disease, which had been going on in the spine, was made evident by a projection of the spinous processes of one of the lumbar vertebræ.

The derangements in the functions of the spinal cord and its nerves which arise from disease in the spine, are also precisely the derangements which ensue from disease in the cord itself. Hence the difficulty so often experienced in determining the source of the nervous derangement, whether, if not depending on disease in the spine, its source be mischief in the brain, or in the spinal cord, or in its nerves; for, in the same way that a current of cold air directed against the face oc-

casions congestion, or inflammation of the portio dura, and, in consequence, paralysis of the facial muscles, so have cold and moisture directed to the loins affected the lumbar and sacral nerves, occasioning cramps and numbness of the limbs, such as ensue from disease in the spinal cord. Or, it may be, that the nervous symptoms present in any case, without direct evidence of disease in the spine, may constitute that variety of paraplegia which occurs coincidently with disease of some internal organ, either in the chest, abdomen, or pelvis, and is unaccompanied by organic change, either in the spinal cord, or its nerves.

TREATMENT OF DISEASE IN THE SPINE.

One rule of treatment belongs to all diseases of the spine ; namely, to keep the diseased parts at rest, and to remove from them all weight and pressure by observance of the horizontal posture. And when ulcerative disease is seated as it is almost constantly, in the bodies of the vertebræ, no restraint of position is to be imposed that can impede the approximation of the healthy vertebræ bounding the seat of the disease, as this would be to put an obstacle in the way of the only process of cure of which the disease is susceptible.

Local depletion, by cupping or leeching the tender part of the spine, is only in some cases an available remedy. The abstraction of blood will, it is true, often remove the tenderness of the spine, but it will quickly recur ; and the objection to a large amount of depletion is, that it takes from the system the strength which will be wanted for its support through a slowly progressing disease. Still, however, in the uncertainty that so often attends the symptoms of spinal disease, local depletion is not to be laid aside as an inappropriate remedy for these symptoms in an early stage of the complaint, when it may be uncertain whether their cause resides in the spine, or in the spinal cord. To instance a case which I have seen. Paraplegia, accompanied by tenderness in a small district of the spine, occurred from no obvious cause. Disease in the vertebræ was consequently apprehended. But local depletion, freely employed, so speedily and completely removed the paraplegia, as to permit no other supposition of its cause than that it was a preternatural afflux of blood to the vessels of the spinal cord. Caution is, however, required in the employ of local depletion ; for, in instances where it has not been at once a remedy for an incipient paraplegia, the repetition of it has been followed by increased failure of nervous power, both motive and sensitive, in the limbs.

Mercury is a remedy for acute inflammatory affections of both the spine and the spinal cord, especially for such as are the consequence of mechanical injury. In the following case of this kind, the beneficial effects of the mercurial treatment were well marked.

Inflammation of the Spine and Cord from Injury. A young woman fell down stairs flat on her back. For several days afterwards, blood was mixed with the urine, and there ensued severe pain along the spine, also in the back of the head, with defective vision, squinting, numbness, and convulsions in the upper and lower limbs, and fever. Under these circumstances, inflammation of the spinal cord, extending to the brain, appeared to be the disease, and mercury the remedy. Accordingly, calomel and opium were freely administered, and mercurial ointment was applied to the spine. Directly salivation was produced, the subsidence of the pain in the spine, and of all the other symptoms, was so marked, as hardly to warrant any other inference than that the mercury had stopped the progress of inflammation in the spinal cord, or its membranes.

The mercurial treatment, it must, however, be admitted, is beneficial only in a limited proportion of spinal and paraplegic affections; and this consideration, in reference to it, is always to be borne in mind —that when not directly of benefit, its tendency is to lower the vital powers, and whatever has this effect, is almost sure to increase the spinal complaint and the nervous symptoms associated with it.

One other narrative it may be well to furnish, in illustration of the treatment required in cases of inflammation of the spine, implicating the spinal cord, directly consequent on mechanical injury.

Inflammation of the Spine and Cord from Injury. A man, aged twenty-one, whilst carrying a basket of vegetables on his head, was knocked down and fell on his back. He walked to the hospital, but was not retained there, as the only discoverable injury was a slight bruise of his knee. In returning home, he fell six or seven times, because, as he said, his legs gave away under him. By the next morning he had wholly lost the use of his lower limbs, and was, consequently, conveyed again to the hospital. The motor power in the limbs was wholly lost, but the sensation in them was preternaturally acute. The spine was extremely tender in its whole extent, and there was, besides, retention of the urine. The skin generally over the body was hot and dry, the pulse full and sharp. Ten ounces of blood were removed by cupping from the spine, and afterwards twelve ounces of blood were taken from the arm. Saline medicine, with antimony and hydrargyrum

cum cretâ, was freely administered, and due attention was paid to the state of the bladder, the urine being very acid, and so loaded with mucus that it flowed with difficulty through the catheter. To prevent the lodgment of mucus in the bladder, it was daily washed out with tepid water, by means of a double-tubed catheter. The gums became sore, and they were kept so by the continued administration of mercury. By the twenty-seventh day, the bladder had recovered its power; as yet, however, there was no improvement in the limbs. But from this period, their motor power gradually returned; so that, at the end of two months, the man was discharged from the hospital, walking well, and in every respect restored to health.

In cases which are presumed, from their history, to be examples of rheumatic inflammation of the investments of the spine, iodide of potassium in the chronic form of the disease, and calomel with opium and antimony in its acute form, are the suitable, and, in many instances, successful remedies.

There is another remedial agent applicable to certain paraplegic affections, such as seem to have had their origin in exposure to sudden and extreme variations of heat, cold, and moisture. Whether in these paraplegic affections, the spinal cord is affected primarily, or but secondarily, from inflammation of the coverings of the spine, may be doubtful; but the distinction is not of moment, if, for the relief of the paraplegic affection, however it has arisen, an effectual remedy can be administered. Such a remedy, in certain cases, is the bichloride of mercury, in doses of the sixteenth or twentieth of a grain twice or thrice a day, but continued for a long period, even for many months. Sir B. Brodie has been, I believe, long in the habit of employing this remedy in such cases. My attention was directed to it by Dr. Latham, who stated to me, as the results of his experience of its use in all degrees and modifications of impaired nervous power to complete paraplegia, that, in many cases which had occurred under his observation, there was every reason for believing that the bichloride of mercury, given in combination with the tincture of bark, had been the means of effecting the complete restoration of the use of the limbs; in other words, of curing the paraplegia. According to the circumstances of the case, Dr. Latham has been accustomed to direct the sixteenth or twentieth of a grain of the bichloride with a drachm of the tincture of bark twice or thrice daily; in this way I have administered it, and certainly with benefit.

Among other cases in the hospital treated upon the foregoing plan, was the following. A man, aged twenty, had suffered from paraplegia

for eight months, which, upon investigation, could be ascribed to no other cause than the exposure to alternations of heat and cold in his occupation as a blacksmith. With every advantage of rest in the horizontal posture, and attention to his general health, he had taken the sulphate of zinc in doses of two grains three times a day, first alone, and then with twenty minims of the tincture of cantharides, continuously for six weeks, but without any amendment. I then directed for him the sixteenth of a grain of the bichloride of mercury, with a drachm of the tincture of bark, three times a day. He had taken these remedies but a week, when he became sensible of improvement in the condition of his limbs. The improvement was steadily progressive. In about six weeks, he walked about the ward with ease and firmness. Before he commenced the use of the medicine, he could neither stand securely nor raise his legs from the ground.

I would not state, that the remedies just mentioned are suited but to one class of cases of paraplegia, or that all belonging to this class will be cured by them; but, looking to the fact of the many cases of paraplegia which admit of no relief, and to the many others which admit only of partial relief, and bearing in mind the impossibility of discriminating by their symptoms, the cases which are curable from those which are not, value must be attached to remedies which have been the means of cure in any number of cases, however small it may be. Dr. Burrows states to me his impression of the results of the treatment of paraplegia, to the effect, that mercury in one or other of its forms, is the remedy from which the largest amount of success can be obtained; but that when pushed to the extent of salivation, although it may produce a temporary amendment, it will sometimes, by its lowering effects on the vital powers, cause a subsequent increase of the paraplegic symptoms.

It is not intended to imply by the foregoing observations, that the sulphate of zinc is a powerless agent in paraplegia, for I know it is not so; there are undoubted instances of its efficacy; but these, as it has appeared to me, occurred in a class of cases where there had not been an inflammatory origin of the disease, such as has belonged to those examples of paraplegia for which mercury has proved an effective remedy.

Upon the question of the utility of counter-irritation in diseases of the spine, much diversity of opinion exists. My impressions respecting it are of considerable doubt, whether counter-irritation ever arrests

the progress of scrofulous disease in the vertebræ. But I have thought that, in other ulcerative diseases attacking the vertebræ, or their fibro-cartilages, counter-irritation, whilst alleviating the pain and tenderness in and around the diseased parts, has arrested the progress of the disease. On another point I have no doubt, namely, that in scrofulous, as also in other diseases of the vertebræ, counter-irritation may be the means of withdrawing from the spinal cord and its nerves, the irritation to which the disease in the vertebræ has given rise. And this it often does immediately, and in the most marked way, by at once restoring to the patient the use of his limbs. So many clear instances of this result of the treatment by issues have occurred within my own observation, that I can entertain no doubt of the correctness of the view here stated respecting it. But the best evidence on this point is obtained from hospital practice; for here the patients, on regaining the use of their limbs, frequently will submit to no further restraint; they leave the hospital, and suffer the issues to close; but, on again becoming unable to walk, they return, soliciting the re-application of the issues. One patient I had who three times returned to the hospital to have the issues re-made, in the conviction of the benefit she had received from them.

The following is a short history of one of the earliest of the cases of diseased spine in St. Bartholomew's Hospital, which Mr. Pott treated by issues. It occurred in the recollection of Mr. Abernethy, who stated to me, that the patient was a lad admitted by Mr. Pott into the hospital, with angular distortion in the dorsal region of the spine, and complete loss of power in his lower limbs. Issues were made upon the spine, and with such effect that the boy speedily regained the power of walking. Mr. Pott, delighted at this speedy, and seemingly complete recovery, detained the boy in the hospital for the object of being shown to strangers, as a striking example of the efficacy of the new plan of treatment. But in the hospital, the health of the boy declined, and he then rapidly sank. Scrofulous disease was found in the bodies of the vertebræ, and miliary tubercles had formed in the lungs*.

The cases of disease in the spine, wherein the most expectation of benefit from issues may be reasonably entertained, are those of the occurrence of a partial paraplegia in an early stage of the disease, the prominent symptoms of which are spasms, numbness, tremulous move-

* Museum of St. Bartholomew's Hospital, Fourth series, No. 14, Plate 21, fig. 3.

ments in the limbs, bespeaking irritation of the spinal cord rather than the compression of it. On the other hand, the cases where less expectation of benefit from issues is to be entertained, are those where the advanced stage of spinal disease is accompanied by increasing diminution of the motive and sensitive power in the limbs, indicative of either a softening of the spinal cord or the actual compression of it. But the most unfavourable of all are the cases where sudden and complete paraplegia occurred in the advanced stage of spinal disease; for then the cause of the paraplegia is almost sure to be compression of the cord by displacement of the bones in the way that has been explained, and of which the following is an example.

Compression of the Spinal Cord by Displacement of the ulcerated vertebral bodies. In a youth, aged seventeen, angular distortion of the dorsal vertebræ had been gradually increasing for two years, without mpairment either of sensation or motion in the limbs; and then, in the course of two days, both lower limbs became completely paraplegic, after which he gradually sank. On examining the spine, I found that the body of the fourth dorsal vertebra was almost wholly destroyed, whilst the bodies of the third and fifth vertebræ were ulcerated only in their front parts; the posterior parts of these vertebral bodies being forced backwards into the spinal, had constricted the cord. A paraplegia thus produced must of course be irremediable.

In diseases of the spine, the reparative processes, under the most favourable circumstances, are of slow progress. When any of the vertebral bodies have been destroyed, it is not to be expected that osseous union of the healthy vertebræ bounding the seat of the disease will be completed in less than a year. Accordingly, within a shorter period than this, it will not be safe for the patient to resume the erect posture. In a boy who had disease in the last dorsal and first lumbar vertebræ, accompanied by paraplegia, issues were made upon the spine with the effect of restoring the use of the limbs. Only a few months had elapsed from the commencement of the treatment; yet he was able to walk; in descending a ladder he missed a step, but alighted on his feet. He said that this jarred him very much. Convulsions of the limbs immediately ensued, and fever followed, which in a few days was fatal. On examining the spine, I found purulent fluid around the theca of the cord. The vertebræ bounding the seat of the disease were but weakly united by incomplete bridges of osseous substance,

extending over the front surface of their bodies*. It was evident that the boy had walked with an insecure condition of the spine, and hence the fatal consequences of an accident which otherwise would probably have been harmless.

Much caution is necessary in pronouncing upon the condition of a spine which has been once the seat of disease, whatever time has elapsed since it commenced, and however favourable may be the apparent condition of the patient; for, in some examinations, I have found a wide gap in the front of the spine, when, from the ease and firmness with which the patient walked, there was the best reason for presuming, that the consolidation of the vertebræ, above and below the seat of the disease, had taken place. And, in such instances, I have found, that the approximation of the healthy vertebral bodies had been prevented by anchylosis of their articular processes; but that this had given sufficient strength to the spine for the maintenance of the erect posture, notwithstanding the persistence of the gap in its front part, where the vertebral bodies were destroyed.

PSOAS ABSCESS.

In its principal features, psoas abscess is so intimately connected with diseases in the vertebræ, that its history is here introduced.

Under this designation are usually comprised the collections of seropurulent or purulent fluid, or of scrofulous deposit, fluid or consistent, formed either in the psoas muscle, or in the cellular tissue adjacent to it.

The frequent seat of psoas abscess is the cellular tissue upon the front of the psoas muscle; it is also found by the side of the muscle, and behind it, and occasionally in the centre of the muscle. In the latter case, the tumor of the abscess is oblong or spindle-shaped, in correspondence with the form of the muscle; and it is well to note this, as there are instances of psoas abscess presenting no other evidence of its existence than by the recognition of this oblong or spindle-shaped swelling through the relaxed abdominal parietes.

In a large proportion of cases, psoas abscess is accompanied by scrofulous disease of the vertebræ; but it is, in some instances, accompanied by simply ulcerative disease, commencing either in the vertebral bodies or fibro-cartilages. In some cases, the morbid change in the vertebræ accompanying psoas abscess, is nothing more than the

* Museum of St. Bartholomew's Hospital, Fourth series, No. 15.

slight absorption of the surface of the bones, with which the purulent or scrofulous deposit had been in contact. And there are instances of psoas abscess accompanied by perfect soundness of the vertebræ and their fibro-cartilages. I have happened to examine three such cases in which no morbid change could be discovered in any of the vertebral structures. Although such cases are rare, the knowledge of them is important, as it instructs us not to regard a psoas abscess as sure evidence of disease in the spine.

A remarkable effect of psoas abscess is, to withdraw from the spinal cord whatever irritation had previously been excited in it by the disease in the vertebral structures. Accordingly, it has been observed, that in diseases of the spine, the co-existence of psoas abscess with the impairment of motion and sensation in the limbs is most rare. I cannot state that I have known a well-marked instance of it. And to the same effect is the observation, that issues are productive of no benefit after the formation of psoas abscess; for the suppuration of the abscess has already withdrawn all irritation from the spinal cord.

In a certain number of cases, psoas abscess remains within the abdomen, confined to the neighbourhood of the psoas muscle; but more frequently it extends downwards, in the direction of the tendon of the psoas into the thigh: and here it appears on one or other side of the femoral vessels, or in front of them. Occasionally, the abscess takes its course downwards, behind the femoral vessels. I have examined three such cases, and, in two of them, the pulsations of the femoral artery had been recognized upon the front of the swelling. Dupuytren has stated, that he was sent for to open an abscess in the thigh, and was surprised to see pulsation on its front part. He supposed it must be an aneurism, until he perceived that the throbbing was confined to a narrow line of the tumor, and thus he became convinced that the femoral artery was only lifted up*. These, moreover, are the cases where the psoas abscess has been observed to extend to the lower part of the thigh; and it has descended even as low as the ham.

There have been instances of psoas abscess following the course of the tendon of the psoas muscle to the trochanter minor, and then passing on the inner-side of the femur to the posterior part of the thigh, where the abscess has presented in the space between the tuber ischii and trochanter major. Such had been the course of the abscess in several instances which I examined.

* Leçons Orales, t. i.

There have also been instances of psoas abscess in which the matter has descended from the abdomen into the pelvis, and has then passed through the great ischiatic hole backwards to the nates, where it has presented near the anus. And, in many of these cases, the lodgment of the matter within the pelvis has been followed by destruction of the sacro-iliac articulation, and by necrosis of portions of the sacrum, or os innominatum, and, in other instances, by ulceration of the coats of the bladder, or rectum, through either of which organs, the matter has in this way, found an outlet.

An exception to the ordinary characters of psoas abscess presenting in the thigh has arisen in the following way. The pressure of the confined matter has caused the absorption of the fascia lata to a small extent; consequently, the matter has passed through a small aperture in the fascia into the subcutaneous adipose and cellular tissue, and here the cyst of the abscess has formed a circumscribed and pendulous swelling of an adipose tumor as to have been mistaken for it, in more than one instance within my own knowledge; an operation having been, in one case, undertaken for the removal of the supposed adipose tumor, which proved to be part of the cyst of a psoas abscess.

Of the same characters as psoas abscess, is the abscess which, in many instances of disease in the vertebræ, and their fibro-cartilages, presents posteriorly, near the spine, either upon the posterior parts of the ribs, or lower down, in the space between the last rib and the ilium.

It may be of use here to note the chief points of distinction between psoas abscess and the iliac abscess, as it is designated from its seat in the iliac fossa.

Iliac abscess is ordinarily formed either in the cellular tissue between the peritoneum and the fascia iliaca, or between the fascia and the iliacus muscle. It consists, in most instances, of a purulent, or sero-purulent fluid, not of the more consistent scrofulous deposit which so frequently forms the contents of psoas abscess.

Iliac abscess is, in many instances, directly referrible to one or other of the following occurrences—exposure to cold, strain of the lumbar muscles, fall upon the loins; but it is also not an infrequent consequence of simple weakness of the system, however induced. Under these circumstances, it often occurs in females, as a consequence of parturition. Iliac abscess, moreover, is one of the examples of local suppurative inflammation, the consequence of acute rheumatism. A man, aged twenty-one, was admitted into St. Bartholomew's Hospital under the

care of Dr. Burrows, suffering from acute rheumatism in several of his joints. He had also a large collection of matter in the right iliac fossa, and extending downwards to the front of the thigh on the inside of the femoral vessels. Soon after his admission, he died suddenly from inflammation in the membranes of the brain. On examination, the abscess was found to be situated between the iliacus internus and its fascia, and it was continued upwards upon the psoas muscle of the spine; but there was no morbid change in any of the structures of the spine.

Between the iliac and psoas abscess, there is this important difference, that the latter, far more frequently than the former, is accompanied by disease in the vertebræ. And it is for this reason that experience shows a larger proportion of perfect recoveries from iliac than from psoas abscess. Other distinguishing features of iliac abscess are, that it usually presents just above Poupart's ligament, near the anterior superior spine of the ilium. Occasionally, the absorption of the fascia iliaca, in the line of its attachment to Poupart's ligament, permits the matter of iliac abscess to descend beneath the ligament to the front and outer part of the thigh. There are, moreover, cases where the matter of the iliac abscess had descended through the inguinal canal to the groin. Of this occurrence I have seen several instances, but only in male adults, as might be expected from the larger dimensions of the inguinal canal and its openings in them than in females.

Between iliac and psoas abscess there is a difference in respect to the most usual periods of their occurrence. Psoas abscess is most frequent in young persons, whilst iliac abscess is rare in children; its ordinary occurrence is in adults, but before the middle period in life.

There are other circumstances which may be of some help to the diagnosis between iliac and psoas abscess in the early stage of each, when the disease had not passed its first stage of thickening and induration of the cellular tissue of the iliac fossa in the one case, and along the line of the psoas muscle in the other. Pain in the back and tenderness of the spinous processes of the lumbar vertebræ are the premonitory symptoms alike of iliac and psoas abscess. But it has appeared to me that, during the formation of iliac abscess, the patients usually suffer much less inconvenience in walking than during the formation of psoas abscess, apparently from the restraint in the action of the psoas muscle. Thus, in the early stage of psoas abscess, great difficulty and distress are usually experienced in the endeavour to extend the thigh fully, and evidently from the rigidity and contraction of the psoas muscle. In young persons, moreover, the gait which is attendant on

an incipient psoas abscess, bears sufficient resemblance to that of disease in the hip-joint to be mistaken for it, which I have known to happen in several instances. Detection of the real disease, under such circumstances, will rest on the observation of the rigidity of the tendon of the psoas, just below Poupart's ligament, and of the tenderness, probably with induration, just above Poupart's ligament, and continued upwards in the line of the psoas muscle.

TREATMENT OF PSOAS ABSCESS.

But few observations on this part of the subject can here with advantage be offered.

It is an important feature of psoas abscess, in its bearing on the consideration of the treatment, that in a certain number of cases the abscess, when fully formed, will remain stationary, exciting no more inflammation in the adjacent parts than will be sufficient to wall-in the matter, and confine it within its original limits. Thus the abscess may continue for an indefinite period, interfering but little with the active occupations of life. I have known instances of psoas abscess so continuing for many years, with no other evidence of its existence than the persistence of the swelling; with, however, some diminution of it, and an increase in its firmness. In the instances where such psoas abscesses of old formation have, at a distant period, been examined, the matter was found converted into a solid substance, having the physical and chemical qualities of adipocire*.

The knowledge of the fact, that even in a small proportion of cases, a psoas abscess has been observed to undergo no change prejudicial to the part, or to the health of the individual, furnishes a ground for not interfering with the abscess by puncture, or other means to the same effect. But there is another, and still better reason for abstaining from such interference, because it applies to a larger proportion of cases; it is, that the disappearance of the abscess may take place by the absorption of its contents; and in this way the disease be removed by what may be termed a natural process of cure. I know the opinion has been expressed, and upon good authority, that collections of purulent fluid never in this way disappear; but I am sure of the fact that they occasionally do so, by the observation of instances of the disappearance of psoas, but more frequently of iliac abscesses; also of

* Dupuytren Leçons Orales, t i.

instances of the dispersion of chronic abscesses, elsewhere situated, by the application of blisters to the integuments covering them.

The foregoing considerations lead, I think, irresistibly to the conclusion of not opening either an iliac or psoas abscess until it is just about to burst, when, either for the relief of the painful distension of the integuments, or to prevent the ulceration of them, the opening may be expedient. And then, certainly, it is desirable that the opening should be so free as to afford the readiest outlet for the contents of the abscess, that the matter may not, by lodging any where, give rise to disease in any of the adjacent bones or joints.

The means calculated to effect the dispersion of an iliac or psoas abscess, are such measures of diet, medicine, and general management as will impart strength to the system; and I can state, that I have known cases wherein, after but little expectation had been entertained of the dispersion of the abscess, yet by the vigorous prosecution of these measures the abscess gradually and permanently disappeared. The following cases will be sufficient illustrations of this fact.

Iliac abscess; its disappearance by absorption of the matter. A man, aged twenty-four, of slender frame and hectic aspect, was admitted into St. Bartholomew's Hospital with an abscess extending from the iliac fossa to the front of the thigh. The extent of the abscess was recognized not so much by the swelling as by the fluctuation of its contents extending over a large space, partly below Poupart's ligament, and partly above it, in the direction of the iliac fossa. From Poupart's ligament, the abscess extended three inches down the front of the thigh, on the outside of the femoral vessels. The abscess could not be ascribed to any local cause. It had been several months in progress, and there was no reason for believing that disease existed in the spine. The man remained in the hospital about two months, during which he was confined to his bed; and in other respects the treatment was directed simply to the support of his general health, and through this period the abscess was stationary. The man now left the hospital, and proceeded to Margate, where he remained for the next seven weeks. He then returned to London, with his health greatly improved; and on examining him, I found, to my surprise, that the abscess had wholly disappeared. There remained only some induration, but no tenderness in the seat of it.

Iliac abscess; its disappearance by absorption of the matter. A man, aged twenty-seven, was admitted into St. Bartholomew's Hospital with an abscess, the size of a hen's egg, projecting from the left iliac

fossa. His occupation was that of a bootmaker, and he attributed the formation of the abscess to a strain in his loins in a forcible effort to draw the last out of a boot. Having remained some weeks in the hospital, during which the abscess underwent no change, I advised him to go into the country: this he did, and remained there for four months. On his return to London, I again saw him, when he stated that nothing had been done to the abscess, but that with the improvement of his health, it had gradually disappeared. Firm pressure against the abdominal parietes towards the iliac fossa now detected a thickening and condensation of the tissues, which I presumed to be the remains of the cyst of the abscess.

There is, it must be admitted, a better grounded hope of the favourable result of an iliac than of a psoas abscess, for the reason, that iliac abscess is less frequently than psoas abscess the concomitant of disease in the spine; and, besides, that in a large proportion of cases, the iliac abscess is of the character of a local malady, brought into action by some local cause of irritation applied to the part in which the abscess is seated: it may have been a strain, or some unusual effort of the lumbar muscles, or exposure of the loins to cold, which in a healthy person has determined the suppurative inflammation in the cellular tissue of the iliac fossa. Again, psoas abscess, associated with scrofulous disease of the vertebræ, frequently co-exists with phthisis. In the majority of cases of psoas abscess which I have examined, there was tubercle in the lungs.

The following is an example of iliac abscess occurring under circumstances favourable to its successful treatment.

Iliac abscess presenting at the inguinal ring; its puncture and cure. A man, twenty-five years of age, of robust frame, was admitted into St. Bartholomew's Hospital with a large soft swelling in the situation of the internal inguinal ring: it was of oval form, its long axis measuring three inches in the direction of Poupart's ligament; and in coughing, a forcible impulse was communicated to it. On the first view of the swelling, it was supposed to be a hernia, but on closer examination, a fulness and fluctuation were detected in the iliac fossa, clearly indicative of the nature of the disease. The man stated, that about six months previously, he sprained his loins in lifting a heavy weight, which was followed by severe pain in his back, enduring for many days, and that the swelling in the groin commenced about six weeks ago. As the integuments covering the swelling were becoming discoloured, I punc-

tured it, and a pint and a half of creamy and flaky fluid flowed from the opening. No constitutional disturbance followed the puncture: the purulent discharge gradually diminishing, it wholly ceased; and after a few weeks, the man left the hospital perfectly well.

OF DISEASES IN THE FIRST AND SECOND CERVICAL VERTEBRÆ.

A distinct notice of diseases in this portion of the spine is suggested by the peculiar circumstances of their history.

The diseases of ordinary occurrence in the first and second vertebræ are ulceration of the ligaments and bones, and softening of the bones, with the deposit of tuberculous matter through their cancellous texture. The peculiar danger attendant on the progress of these diseases is, lest any displacement of the bones should ensue, causing compression of the spinal cord. A fatal result in this way does, however, but rarely happen. The ordinary progress of these diseases is as follows,—that after the destruction of a certain amount of bone, the disease ceases, and the adjacent osseous surfaces become anchylosed, with, of course, the loss of the motions of the head upon the spine, the head becoming immovably fixed, and often, besides, inclined to the side on which the chief destruction of bone has taken place. There are, however, instances of ulceration of the first and second cervical vertebræ occurring at an advanced age, when it is not to be expected that any change of the character of a reparative process will ensue, but rather that the ulceration of the bones will continue to the destruction of life, which, in cases of this kind, has happened within a few months from the commencement of the disease.

The following case occurred under the observation of the late Dr. Hope, of St. George's Hospital, by whom the narrative of it was written. It exhibits an instructive view of the symptoms often accompanying disease of the first and second vertebræ; it is of interest, besides, as an instance of the displacement of the diseased parts causing the sudden extinction of life by compression of the spinal cord.

"John Henry, an African, aged twenty-one, a plumber, was admitted into the Marylebone Infirmary, affected with complete fixity of the head on the neck, preceded by intense and constant pain referred to the origins of the sterno-cleido-mastoid muscles, and of the posterior muscles of the neck, deep under the occipital bone. He carried the head immovably erect, and whilst performing any motion of the neck, he sustained the head by applying his hands to each side of the face.

He had constant headache, accompanied by a sense of pulsation in the temples and forehead, with a throbbing and excessive pain in the jaws and teeth, similar to that of toothache. These symptoms were aggravated by stooping, by hot or stimulating food, or by any acceleration of the circulation, and they were alleviated at pleasure by compression of the carotid arteries. The pulse was ninety, full and strong; the tongue furred and white; bowels costive. The first symptoms of the disease were the pain and rigidity in the neck, which commenced ten months previously, and were ascribed to exposure to cold during perspiration. Leeches, blisters, sinapisms, ung. tart. antim., and stimulating liniments had been employed, but only with temporary relief. Sixteen hours before his death he became affected with universal paralysis. Whilst in the act of being raised from the recumbent position, his head suddenly fell forwards, and he instantly expired.

Cadav. Sectio.—Serous effusion under the arachnoid membrane of the brain. One ounce of serum in the lateral ventricles. Base of the cerebellum in a state of incipient ramollissement. The ligaments of the processus dentatus were completely destroyed by ulceration. The whole superior surface of the atlas, with the corresponding parts of the occipital bone, were denuded of periosteum, and presented several deep excavations. The transverse ligament of the atlas was so far absorbed as to have allowed the odontoid process to escape from beneath it, and compress the spinal cord."

MALIGNANT DISEASES OF THE SPINE.

In the section which treats of carcinoma in bone, an instance of hard carcinoma is described, which occurred as a primary disease in the mammary gland, and, secondarily, in various bones, including those of the spine. The following is an instance of another form of carcinomatous deposit, probably occurring as a primary disease in the spine, and in the ribs.

A female, between sixty and seventy years old, was admitted into St. Bartholomew's Hospital, under the care of Dr. Burrows, with paraplegia, which had commenced three months previously. There was complete loss of motion in the lower extremities, and in the lower half of the trunk; the fæces passed involuntarily, but the urine was retained. She complained of numbness in the motionless parts, but could feel distinctly when they were touched. She had no pain in the back, nor was any part of the spine painful on pressure. She gradually sank,

and died five days after her admission with sloughing over the sacrum. On examination, a large carcinomatous tumor was found in the liver; the bladder was thickened and distended with strongly ammoniacal urine; its mucous membrane was ulcerated and covered with flakes of fibrin. The spinal cord, opposite to, and below the seventh dorsal vertebra, was so soft as to resemble thick cream, and it was of a yellow colour. Around several of the ribs and involving their tissue, there were carcinomatous tumors. A tumour of the same kind had formed beneath the pleura, by the side of the seventh dorsal vertebra, and the whole body of this vertebra was so softened that it could be broken up with the finger. The substance of the tumor was not distinctly continued into the diseased vertebra; but there was a mass of similar morbid substance between this vertebra and the theca of the cord, to which it closely adhered, opposite to the point where the softening of the cord commenced. The posterior surfaces of the dorsal vertebræ, from the seventh to the last, were slightly ulcerated. All the carcinomatous masses were white and firm, with an appearance of fibrous bands radiating through them, and interspersed with points of a yellow-ochre and soft substance.

In the foregoing case, the carcinomatous deposit in the spine and ribs was probably a primary disease. But, in most other instances, the malignant disease in the spine has been preceded by carcinoma in the breast; so at least it was inferred, from the fact, that the symptoms of the spinal disease first occurred long after the appearance of carcinomatous disease in the mammary gland*. The vertebræ, when attacked by malignant disease, are found softened and extremely vascular, with their cells filled by hard carcinomatous, or encephaloid, or melanotic deposit. In some of these cases, the spinal cord is simply softened at the seat of the disease in the vertebræ; in others, it is compressed by part of the morbid growth arising from the bones, or from the membranes of the cord, and projecting into the spinal canal. There is also, in general, much fluid effused into the theca of the cord.

The symptoms of malignant disease in the spine are of the same general character as those of other destructive diseases in the vertebræ. Malignant disease of the spine does however, in most instances, exhibit

* Cases of Cancerous or Malignant Disease of the Spinal Column, by Cæsar Hawkins, Surgeon to St. George's Hospital. Medico-Chirurgical Transactions, Vol. xxiv.

one prominent feature which would at once distinguish it with certainty from other spinal diseases, if it were of constant occurrence; this is the very severe pain in the vertebræ, and, besides, the severely painful affections of the parts supplied by the nerves issuing from the diseased portion of the spine. Thus, almost invariably, in malignant disease of the vertebræ, the pain in the back has been constant and agonizing. But unfortunately, in some few cases, it has been decidedly otherwise, and the impaired sensation and motive power in the limbs were not preceded, or accompanied, by any pain in the diseased vertebræ; the symptoms were exactly such as attend the ordinary forms of spinal disease. So far it may be confidently stated, that the existence of constant and severe pain in the spine, in conjunction with the symptoms of disorganization in the spinal cord, are strong grounds for apprehending that the vertebræ are attacked by malignant disease, but that the absence of severe pain in the spine is not sure evidence of the disease in it being otherwise than of a malignant nature.

Malignant diseases of the spine in general proceed rapidly to a fatal termination, as, indeed, might be expected, from the severity of their symptoms. Exhaustion of the vital powers by pain has, in most cases, brought the disease to its fatal result in the course of a few months from its commencement.

CHAPTER III.

DISEASES OF PERIOSTEUM.

INFLAMMATION OF PERIOSTEUM.

Syphilis, rheumatism, and scrofula are well-recognized causes of inflammation of periosteum; it also occurs, secondarily, from inflammation in the medullary membrane, or walls of the bone. In systems debilitated by mercury, and thus rendered particularly susceptible of the influences of cold and moisture, inflammation of periosteum upon one, and often on several bones, is of common occurrence; these belong to the class of rheumatic cases, and it is probably because the surfaces of bones superficially situated are most exposed to external influences, that these are the usual seat of periostitis. By the same consideration it may be explained why periostitis upon the posterior surface of the tibia is rare; and fortunately it is so, for the serous or purulent fluid, here effused beneath the periosteum, would be scarcely within reach of relief by surgical interference.

Among the examples of syphilitic periostitis are instances of its occurrence from the action of the gonorrhœal virus alone, and independently of rheumatism. The following is a well-marked case of this kind. A gentleman had, in the course of ten years, three attacks of gonorrhœa, all severe and lasting a long time. During the last three years, he had suffered from periostitis, first upon the sternum, then upon the cranium. When I saw him, there were several small, firm swellings, from thickening and induration of the pericranium. He stated, that he had had a multitude of such swellings upon every part of the head, which he had subdued by leeches. He had taken no mercury, and had never suffered from rheumatism.

Acute inflammation of periosteum occasions increase of its vascularity—thickening and softening of its tissue—loosening of its connexion

with the bone—serous or purulent effusion between it and the bone. Less acute or chronic inflammation of periosteum occasions thickening and induration of its tissue—increased firmness of its adhesion to the bone—osseous deposit in its indurated tissue. The following appears to be the process of thickening and induration of periosteum. First, its texture softens, and is seemingly unravelled; then, gelatinous substance is deposited into the meshes of the softened tissue, and hardening, gives it the density of fibro-cartilage.

Inflammation of periosteum occasions in the subjacent bone expansion, hardening and thickening of its substance, ulceration, or necrosis of its surface.

Distinct forms of disease have their particular effects on periosteum; thus, from rheumatism, diffuse inflammation of it ensues, followed by thickening of its tissue, or ulceration of it, and occasionally by ulceration, or necrosis of the surface of the bone, by expansion or thickening of its tissue.

Syphilis attacks distinct portions of periosteum, and gives rise to serous or purulent effusion beneath it, to thickening and ossification of its tissue, and to the expansion or thickening of the subjacent bone. It is probable the osseous node is always preceded by thickening and induration of the periosteum. The degree of hardness of a node does not, with certainty, indicate its composition. I have examined nodes which, from their hardness, were supposed to be osseous, and have found them to consist of indurated periosteum. It is probable, that the osseous substance in a node is always a permanent deposit; therefore, that when, by the application of blisters or other remedies, nodes have disappeared, they consisted of thickened periosteum. The syphilitic node is circumscribed, and of a roundish figure; and by these characters, it is distinguished from other enlargements of periosteum, or bone. But rheumatism and syphilis are so frequently combined, that the distinction of their specific effects on periosteum and bone is often lost.

Here it may be observed, that the osseous node does not occur upon the cranium; so far does the pericranium differ from periosteum in its actions under the influence of disease, that under no circumstance does its tissue become ossified. When, from syphilis, isolated portions of the pericranium inflame, circumscribed swellings arise, which are hard and painless, when consisting only of the thickened pericranium—but

soft and tender, when produced by serous or purulent effusion, either beneath the pericranium or into the cellular tissue covering it. In the latter case they have received the expressive designation of soft nodes.

Scrofula in periosteum produces thickening and induration of its tissue; and, in some cases, serous or purulent effusion into its thickened tissue, or between it and the bone.

Scrofulous thickening of periosteum gives rise to a hard and painless swelling, which, in a cylindrical bone, usually occupies its entire circumference. This is the disease of frequent occurrence upon the bones of the fingers in children, enlarging the finger, and giving to it the appearances of disease in the bone. The same changes occur from scrofula, in the periosteum of flat bones, especially of those of the cranium and face; also, upon the long bones, especially the humerus, radius, ulna, and tibia. And here the thickening and induration of the periosteum occasions a firm, solid swelling over the entire circumference of the bone, which it is often difficult to distinguish from enlargement of the bone itself.

Scrofulous thickening of periosteum is a curable disease—thus, in the instances of its occurrence upon the bones of the fingers, the enlargement of the finger which it occasions, although of long endurance, yet, with improvement in the general health, often wholly subsides, leaving the finger in a perfectly healthy condition.

The changes from scrofula in periosteum are characterized by the small amount of accompanying irritation. Even when, from scrofulous inflammation of periosteum, serous or purulent effusion has taken place beneath it, yet, because of the softening of its tissue, none of the acute pain and severe constitutional derangement ensue which accompany such effusions occurring under other circumstances.

Suppuration in the tissue of periosteum, thickened by scrofulous inflammation, or beneath the thickened membrane, is often followed by ulceration of the subjacent bone, and occasionally by exfoliations from its surface. But the disease is still curable, and without deformity; and, in this respect, scrofulous inflammation of periosteum, through all its consequences, is strikingly contrasted with the effects of scrofulous disease in bone, which has advanced to its tuberculous stage; for here, deformity must ensue, as the consequence of the destruction of the diseased bone not being followed by any reproduction of it.

Scrofulous inflammation often attacks the periosteum upon several bones simultaneously, or in quick succession, occasioning thickening of

the membrane upon some bones, serous or purulent effusion beneath it upon others, and then being followed by superficial ulceration of the bone, or by small exfoliations from it. Moreover, when scrofulous inflammation has attacked the periosteum of one bone, if disease should arise in other bones simultaneously, or in succession, it is almost sure to be of the same character; that is, it will be confined to the periosteum, and, therefore, be curable without destruction of the bone and the deformity consequent on it.

Inflammation of periosteum near a joint is apt to extend to the synovial membrane; thus instances occur of inflammation in the knee-joint, apparently by an extension of rheumatic inflammation from the periosteum of the tibia; and there are instances of destructive inflammation of both the knee and the ankle-joint, the consequence of scrofulous inflammation of the periosteum upon the adjacent parts of the tibia. But, amidst the complications of these diseases, there are, also, instances in which inflammation extends from the synovial membrane of a joint to the periosteum of the adjacent bones. A girl in St. Bartholomew's Hospital received an injury to the elbow-joint, which occasioned acute inflammation of its synovial membrane; by local depletion and the other parts of a soothing treatment, the inflammation of the joint was completely subdued. She now became distressed by acute and deep-seated tenderness in the adjacent parts of the arm and fore-arm, evidently the consequence of inflammation in the periosteum upon the humerus, radius, and ulna, which readily yielded to the administration of iodide of potassium.

There is an example of periostitis deserving particular notice, on account of the severity of its effects,—this is upon the pelvis, and mostly upon its posterior part, and when it occurs near to the hip-joint, its symptoms so much resemble those of disease in the joint itself, that they are apt to be mistaken for them. The severest and most distinctly marked cases of this description which I have seen, occurred in females, and apparently as a secondary affection succeeding to parturition. The following is the history of one of these cases.

Periostitis upon the Pelvis. The patient stated that, on the eighth day after her labour, she was attacked with acute and deep-seated pain behind the left hip-joint, and that this pain continued without remission through the next five weeks, when she became a patient in St. Bartholomew's Hospital. I found the parts between the left hip-joint and the

sacrum tense and acutely tender; but there was no increased heat, inflammatory swelling, or redness; the tenderness and tension extended around the crista of the ilium to its inner surface, and the pain was greatly aggravated by the slightest movement of the hip-joint. For several weeks, I expected the patient would become exhausted by the severity of the pain. At length a fulness was perceived, just above Poupart's ligament, near the spine of the ilium; and an opening here formed, from which matter was discharged with some relief. Soon afterwards, I discovered a fulness and fluctuation at the back of the pelvis, a little below the crista of the ilium; and here I made an incision, discharging about six ounces of matter. With a probe passed into the opening, I discovered that the matter had formed close upon the dorsum of the ilium, which was deprived of its periosteum. Immense relief was obtained by this discharge of matter, and, in a few days afterwards, it became evident that the painful movements of the hip-joint were owing to its contiguity to the inflamed structures, and that the joint itself was sound. The seat of inflammation had here been the periosteum of the ilium, and probably on both its surfaces.

In another instance of periostitis consequent on parturition, the disease, in a milder form, was confined to the dorsum of the ilium, where, however, it was characterized by the same deep and acute tenderness continuing until relief was obtained by the discharge of matter. In both cases, the fulness, and fluctuation of matter, upon the ilium were discovered a little below the crista, and just in front of the anterior border of the glutæus maximus muscle, the incision being here made through the glutæus medius to the bone.

I have met with other instances of periostitis upon the posterior part of the pelvis, referrible only to rheumatism, in which the deep-seated fluctuation and pain indicated the existence of effusion, probably of serous fluid, beneath the periosteum; but, during the administration of iodide of potassium, with some help, perhaps, from a plaster of mercury and ammoniacum, the disease gradually subsided, without any discharge of the effused fluid.

It may be well here to notice another class of cases of rheumatic inflammation affecting the periosteum covering the trochanter major of the femur, which, from the situation of the disease, is apt to be mistaken for inflammation in the hip-joint. Tenderness and thickening of the tissues immediately around the trochanter, giving to it increased breadth and prominence, are the immediate consequences of the in-

flammation of its periosteum. When not arrested at its commencement, the periostitis so situated is not infrequently followed by necrosis of small portions of the trochanter; and, in such cases, the exfoliation of the dead bone is, in general, an extremely slow process. I have known cases where the patients were, from this cause, disabled for many months, with a fistulous passage in the outer part of the thigh, constantly discharging, and leading to the dead bone.

TREATMENT OF INFLAMMATION OF PERIOSTEUM.

The most certain means of arresting acute inflammation of periosteum are, local depletion, soothing applications, and the constitutional action of mercury. Accordingly, the free exhibition of calomel and opium, combined with the repeated applications of leeches, poultices, and fomentations are the measures to be actively pursued for the object of subduing acute inflammation of periosteum before it reaches the stage of serous or purulent effusion.

For the less acute inflammation of periosteum, iodide of potassium is to be regarded as the specific remedy; for it very rarely fails to stop the progress of the disease, and, in much the largest proportion of cases, completely cures it. This statement of the remedial agency of iodide of potassium is to be taken in its most comprehensive sense. Whether it be the inflammation of periosteum adjacent to an exfoliating bone, or investing an enlarged bone, or that which is the consequence of scrofula, syphilis, or rheumatism, there has not appeared to me to be any difference in respect to the influence of this remedy upon the disease. And, with respect to the suitable doses of it, I have but to repeat the statement already made, that my impression is in favour of administering it in doses of two or three grains, three times a day, in either decoction of sarsaparilla, or a bitter vegetable infusion, or camphor mixture. I subjoin the following case, as it was the first record which I made of the remarkable influence of iodide of potassium in subduing inflammation of periosteum, the consequence of syhilis.

Syphilitic Periostitis upon several bones—cure by Iodide of Potassium. A man, aged thirty, was admitted into St. Bartholomew's Hospital in September, 1832, on account of a sloughing sore on the penis, for the cure of which mercury was administered to the extent of producing full salivation; and he left the hospital with no visible remains of disease. In the period between October, 1832, and August, 1835, he had several attacks of sore throat, accompanied by eruptions, for

which he repeatedly took mercury, and on each occasion of doing so, the symptoms disappeared. During the eight months preceding August, 1835, he had suffered severe pain in his shins, for which he had not used mercury. On his re-admission into the hospital, there were circumscribed inflammatory swellings upon the upper part of each tibia, and upon one ulna. These swellings had been so severely painful as almost to deprive him of sleep. In the swelling upon the tibia, fluctuation was evident, from fluid beneath the periosteum. Upon the other tibia, and upon the ulna, the swellings appeared to consist of thickened and indurated periosteum. No other application was made to the swellings than a linseed-meal poultice. Five grains of iodide of potassium were administered three times a day. On the second night after its commencement, the pain had so far ceased that the patient slept well. The same dose of iodide of potassium was continued for a fortnight, when the tenderness of the diseased parts had wholly subsided, and he could bear the part of each bone that had been the seat of disease, to be sharply struck without uneasiness. The swellings upon both tibiæ and upon the ulna had considerably diminished, and the fluid effused upon one tibia had disappeared. The man left the hospital wholly free from complaint.

In the foregoing case, the iodide of potassium was effectively administered, in doses of five grains, three times a day; but, from subsequent experience, it has appeared, that the same amount of benefit from it is obtained by the smaller doses of two or three grains.

Upon the subsidence of acute inflammation in periosteum, the mercurial treatment is often advantageously changed for the administration of iodide of potassium. This is well shown in the following case, which, besides, is an example of a not infrequent complication of diseases, namely, periostitis of the femur, with inflammation of the hip-joint.

Periostitis of the Femur with Inflammation of the Hip-joint, the effects of rheumatism. A man, aged twenty-five, whose occupation was such as almost constantly to expose him to cold and moisture, was admitted into St. Bartholomew's Hospital, after a confinement to his bed for nine weeks. On his admission, the local symptoms clearly denoted the existence of acute inflammation in the hip-joint, with inflammation of the periosteum of the shaft of the femur; his general condition was such as might be expected from nine weeks of constant and severe suffering; his pulse was frequent and sharp; tongue dry and furred;

countenance sunk, with general emaciation. In the view of getting his constitution speedily under the influence of mercury, I directed that mercurial ointment, thickly spread upon lint, should be constantly applied around the hip-joint, and around the thigh; also that he should take two grains of calomel with a quarter of a grain of opium, and three grains of antimonial powder every three hours. Just in proportion as the mercurial affection of the system was manifested, so did the pain in the hip-joint, and the deep-seated pain around the femur, subside, with corresponding improvement in the general health. When the gums had become fully affected, I thought that iodide of potassium with sarsaparilla, in combination with a generous diet, might be advantageously administered for the removal of the remaining tenderness in the parts that had been so long inflamed, and for the restoration of the general health. Under this treatment, amendment in every respect was progressive, until every trace of disease had disappeared. The man left the hospital with the perfect use of his hip-joint.

The chief signs of the existence of serous or purulent effusion beneath inflamed periosteum are the sense of tension, with acute and persisting pain in the part, accompanied or not by an obscure sense of fluctuation. In certain cases, absorption of the effused fluid has ensued upon the subsidence of the inflammation in the periosteum; in these, probably, the fluid was of a serous character. However this may be, I have known so many instances of acute periostitis upon various bones, followed by the disappearance of all pain, swelling, and sense of fluctuation in the part, as to permit no doubt of the occasional absorption of fluid effused beneath the inflamed periosteum. The remedies conducing to this desirable result were iodide of potassium, with the plaster of ammoniacum and mercury applied to the affected part.

But the division of inflamed periosteum is occasionally required, by the continued severity of the pain, attributable only to the confinement of fluid, serous or purulent, beneath the tense and resisting membrane. By the escape of the smallest quantity of fluid from beneath the periosteum, the relief from pain is immediate and complete. Even in cases where the signs of the confinement of fluid beneath the periosteum are not clear and strongly marked, yet if, in spite of the remedies that have been employed, the pain continues to be severe, the division of the membrane may be expedient, on the ground that, by removing the tension of the inflamed membrane, it will relieve the pain. An argument in favour of the early division of inflamed periosteum is,

that it will prevent disease in the bone, since, in proportion to the duration and severity of the inflammation in the periosteum, will be the risk of ulceration, or necrosis of the surface of the bone. After the division of the periosteum, the closure and speedy healing of the wound has been followed by the return of acute pain, indicating a recurrence of the inflammatory tension of the membrane. Under such circumstances, a second and even third division of it has been performed. To avoid this evil, the immediate adhesion of the sides of the wound should be prevented by placing a layer of lint between them, taking care it extends to the bone. The subcutaneous incision of inflamed periosteum has been ingeniously suggested, but there are objections to it apparently of weight; it would not afford complete relief to the tension of the inflamed structures, and it would not remove the congestion of their vessels; indeed, the profuse hæmorrhage ensuing from the freely-divided parts is probably of much service.

Scrofulous inflammation of periosteum, or rather the state of constitution which gives rise to it, constitutes one of the forms of disease in which cod-liver oil is given with the best effect. In such cases, therefore, it is a valuable adjunct to the iodide of potassium, which will remove any irritation there may be in the thickened or otherwise diseased periosteum, whilst the cod-liver oil, by giving activity to nutrition, and thereby improving the general health, will be the means of altering the state of constitution to which scrofulous disease of periosteum is owing.

ILLUSTRATIONS OF VARIETIES OF PERIOSTITIS.

Inflammation of the Pericranium—Treatment by Incision. A middle-aged man, of full habit, was admitted into St. Bartholomew's Hospital, suffering constant and severe pain in his right ear, and over the whole of this side of the head, accompanied by much inflammatory fever. Puriform discharge issued from the ear, but without relief to the pain, which continued most severe, and was attended with erysipelatous redness and tension of the skin over the whole of this side of the head and face. All the local and constitutional antiphlogistic remedies perseveringly used afforded only temporary relief, each depletion by cupping or leeches procuring the alleviation of pain for only a few hours. Thus the case had proceeded nearly a month, when I made an incision through the coverings of the cranium to the bone, from the base of the mastoid process directly upwards, nearly three

inches, taking care to divide the pericranium to the full extent of the outward incision. Not a drop of matter could be detected escaping through the wound. The relief from pain, however, was immediate and complete, and it could only be ascribed to the removal of the tension of the inflamed pericranium. The wound healed soundly, and there was no return of the disease.

There have been instances in which a blow on the head was followed by inflammatory changes in the injured part with severe nervous disorder, which endured for several years, and was then completely relieved by division of the injured portion of the pericranium. The following belong to this class of cases.

A woman received a blow on the head, behind the left ear, from the immediate effects of which she recovered. But pain in the injured part afterwards arose, and continued for four years: she then had convulsions with paralytic affections. At the place of the injury, a small portion of the integument became red, and gentle pressure on this part was followed by a convulsion. By a free incision to the bone, and allowing the wound to suppurate, all these complaints were removed*.

A boy, aged eight years, received a severe blow on the crown of his head. A painful feeling continued in the scalp at the injured part, and, for ten years, he was subject to intense headaches. At the age of twenty-four, a small swelling arose in the original seat of the injury, with redness of the skin; and pressure on this part occasioned intense pain. By a free division of the coverings of the cranium, immediate and complete relief was obtained†.

There are instances of acute periostitis occurring extensively over two, or even more, of the long bones simultaneously, or in quick succession; and when it occurs upon two contiguous bones, inflammation is almost sure to ensue in the intervening joint. The following is the history of such a case.

Inflammation of the Periosteum of the Tibia and Femur, and of the Knee-joint. A girl, fourteen years of age, was admitted into St. Bartholomew's Hospital, with deep and extensive suppuration in the leg. She stated, that she had received a severe blow on the leg, a fortnight before the inflammation in it commenced. Openings had been

* Œuvres posthumes de Pouteau, tome ii. Mémoire sur le danger des coups à la tête.

† Ibid.

made along the spine of the tibia, for the evacuation of the matter—and through these, the whole front surface of the bone was discovered to be denuded of periosteum—hence it was supposed that the bone had perished. On obtaining, however, a fuller view of the bone, I observed its surface to possess the pinkish tint of living bone, and, accordingly, I concluded the disease had commenced in inflammation of the periosteum, followed by suppuration beneath it; and this proved to be the correct view of the disease. As the activity of the inflammatory processes in the leg subsided, severe pain arose in the deep structures around the lower third of the thigh; and, at the same time, acute inflammation attacked the synovial membrane of the knee-joint. Suppuration ensued beneath the periosteum of the femur; through an incision made in the outer side of the thigh, about eight ounces of matter were discharged; and, at the bottom of the abscess, the bone was found to be denuded of its periosteum. From this period there was a gradual subsidence of disease in all the three situations it had occupied—the leg, thigh, and knee-joint; and ultimately the patient left the hospital with a sound state of the limb*.

In another variety of disease, inflammation occurs, without apparent cause, in limited portions of the periosteum, upon several bones at different, and often very distant, periods. The following is a case of this kind.

Inflammation in portions of the Periosteum of many bones at distant periods. A man, aged twenty-four, was admitted into St. Bartholomew's Hospital, under the care of Mr. Abernethy, with disease in his left leg, which had commenced ten years previously in inflammation of the periosteum of the tibia, followed by ulceration of the bone, and exfoliations from its surface, after which, the wound had healed, and remained so for a year; then, in the same part, fresh ulcerations of the bone and exfoliations from it had ensued; and many times through the following years, the same morbid processes had been repeated. Three years after the commencement of disease in the left leg, inflammation arose in the periosteum of the right tibia, and subsequently of the left ulna, followed, in each instance, by exfoliations from the surface of the bone. At length, all the parts had become sound excepting the leg

* Cases similar to the above are recorded by Dr. M'Dowell, as instances of acute inflammation of synovial membrane, combined with inflammation of periosteum, "attacking different articulations with great rapidity, and causing death in several instances." Dublin Journal of Medical Science, Vols. iii., iv.

first diseased; and as this had so long been a source of suffering, Mr. Abernethy yielded to the solicitations of the man for its removal.

On examining the limb, I found the periosteum over nearly the whole of the tibia thickened, but it was soft and loosely adherent to the bone; the surface of the bone was rough and irregularly excavated, and its medullary texture, in great part, obliterated by osseous deposit. Shortly after the healing of the stump, fresh attacks of inflammation occurred in the periosteum of the right tibia, also in that of the ulna, followed by small exfoliations from each bone; and, on the occasion of my last seeing this man, many months after the removal of his limb, he was still suffering attacks of inflammation of the periosteum upon one or other bone.

MALIGNANT DISEASE OF PERIOSTEUM.

I have now to describe a malignant disease of periosteum, the consequence of long-continued or repeated attacks of inflammation, altering its structure and giving rise to the growth of a fungous excrescence from it. I have seen this disease only in the front of the leg, probably because this is most exposed to injury; and here, from the thinness of the soft coverings, inflammation, more readily than elsewhere, extends to the periosteum and bone. Accordingly, this disease is usually traced to local injury, followed by repeated inflammatory attacks in the skin and subjacent structures, occasioning ulceration of them, including the periosteum, and, in some instances, the bone, with exfoliations from its surface. At length, a fungous excrescence arises from the diseased parts, which, in some instances is soft and flocculent on its surface, with a firm, greyish, gelatinous base, whilst, in others, it consists of a firm, gelatinous substance throughout. Usually the fungus is very sensitive, and, when injured, bleeds very freely.

The grounds upon which I have considered this to be a disease of periosteum are, that, in some instances, the fungous excrescence appeared to have arisen directly from the periosteum, altered in structure by inflammation, that is, thickened and softened, and but loosely adherent to the bone; further, that these alterations in the periosteum, have been observed to extend beyond the limits of the fungus, and, indeed, far beyond the existence of any change in the skin indicating unsoundness of the subjacent parts. Thus, in one case, where the fungus was confined to the lower third of the front of the leg, the periosteum was found preternaturally vascular, thick, soft, and pulpy,

over the whole of the tibia and upon the fibula also. It seemed, therefore from these observations, that a diseased state of the periosteum had preceded the growth of the fungous excrescence from it.

In some of the instances of this disease, the softness and flocculence of the surface of the fungus have suggested its resemblance to certain excrescences arising in the cutaneous tissue, and, accordingly, it has been supposed, that this may be a form of carcinoma originating in the skin, and thence spreading through the subjacent structures. A circumstance, apparently, according with this view of the nature of the disease, was noticed by Mr. Paget, in the examination of a recent specimen of it, that there were scales like epithelial scales in it, similar to those observed in that form of carcinoma of the skin which consists in degeneration of its tissue.

I have regarded this as a malignant disease, for the following reasons. In instances where the fungous excrescence was removed, granulations, apparently healthy, have arisen from the exposed surface of the bone, but they have gradually assumed the characters of the fungus; further, the spread of the fungus is accompanied by destruction of all the adjacent structures; thus, in one case, it penetrated the front wall of the tibia, and then spread largely through the interior of the bone; and in another case, it extended completely through the shaft of the tibia. The absorbent glands of the thigh and groin, however, have not in these cases been affected; nor has the disease, in any instance which I have met with, been accompanied or followed by similar growths elsewhere. Therefore, although for the reasons which have been stated, this disease is to be considered malignant, its action is local, so far at least, that it does not extend beyond the region of the body in which it originates.

On the practical view to be entertained of this disease, little comment is necessary. Experience has proved it to be unsafe to trust to the excision of the morbid growth, for in instances where this was done, and apparently in the most satisfactory manner, the parts exposed by the operation appearing perfectly sound, yet the disease was reproduced. The removal of the limb in which the disease is situated is the appropriate treatment of it.

The following are illustrative examples of this disease :—

I.—A man, aged fifty, stated, that twenty years previously, he bruised his leg, the skin at the injured part, inflamed and ulcerated, and then became apparently sound. Ulceration had many times recurred in the same part of the leg. On some occasions it had con-

tinued sound for several months, and once for about two years. At length there arose from the diseased parts, a soft fungous excrescence, about three inches in circumference at its base. Various measures for repressing the growth of the fungus having been ineffectually tried, the limb was amputated. I found the base of the fungus extending to the periosteum of the tibia. The periosteum was but loosely adherent to the bone, and its inner surface was soft and flocculent. This condition of the periosteum, with increase of its thickness, extended over the tibia some way beyond the limits of the fungus. The surface of the bone beneath the diseased periosteum was rough, in some parts from absorption, in others from osseous deposits.*

II.—A woman, aged thirty-five, stated, that at the age of ten years, she received a severe blow on her leg; this was followed by a succession of abscesses in the injured part, and by the discharge of numerous small pieces of bone. At one period, the parts remained apparently sound for several years; then there occurred, and without obvious cause, fresh attacks of inflammation and more exfoliations. A large and very soft fungous excrescence now arose from the front of the leg, and it was deemed right to amputate the limb. I injected its vessels; the fungus was found to be very vascular, and through the whole of its base, closely identified with the periosteum, which was soft and flocculent, and very readily separable from the bone. Upon the whole of the tibia, as well as upon the fibula, the periosteum was preternaturally vascular, soft, and but weakly united to the bone. Through the whole extent of the diseased periosteum, the bone was rough from irregular absorption of its surface.*

III.—A man, aged thirty-eight, was admitted into St. Bartholomew's Hospital, under the care of Mr. Lawrence, on account of disease in his leg, which had commenced several years previously, immediately after receiving a severe blow on the shin. Abscesses and ulcerations of the soft parts ensued, with many exfoliations of small pieces of bone, at different periods, through the next two years. The sore then healed, and the parts remained apparently sound through the following seventeen years, when he received another blow on the shin in the situation of the old disease. A portion of the integument in consequence mortified, and its separation was followed by the growth of a soft, very vascular fungus, from the subjacent parts, extending over the lower third

* Museum of St. Bartholomew's Hospital, First series, Nos. 126, 127. Plate 15 fig. 2.

* Museum of St. Bartholomew's Hospital, First series, Nos. 42—42 A.

of the front of the leg. The surface of the fungus was of a dark red colour, minutely lobulated, and discharged a thin sanguineous and fœtid fluid: it was very soft, bled freely when touched, but was not very sensitive. Various remedies were ineffectually applied to the fungus; its base gradually extended over more than half the circumference of the limb. Amputation was proposed, but the patient would not assent to it, assenting however to any operation not involving the loss of his limb. Under these circumstances, Mr. Lawrence removed the fungus. The separation of it from the tibialis anticus and extensor digitorum muscles was readily effected, and the exposed surfaces of these muscles, with their tendons, appeared perfectly sound. But on detaching the fungus from the tibia, it was found to have penetrated the wall of the bone to its cancellous and medullary texture. The fungus was then carefully scooped out of the bone, leaving a large vacancy in it, extending to its posterior wall, and to the cancellous texture of its articular end.

Very little constitutional disturbance followed the operation; the whole surface of the wound suppurated freely, and granulations, apparently sound, arose from the inside of the bone, but in a short time, these granulations assumed the appearance of the fungus which had been removed, showing that a reproduction of the original disease had taken place. The patient now consented to the removal of the limb, and on examining it, the fungus was found to have arisen from the whole surface of the bone exposed in the first operation.* Twenty years after the removal of the leg, this man presented himself at the hospital in perfect health.

IV.—A man, aged fifty, was admitted into St. Bartholomew's Hospital, with a fungus arising from the lower and front part of the leg, of the same character as that described in the preceding histories; it was very painful, and bled freely when touched. At the age of four years, he suffered a compound fracture of this leg, the reparation of which was complete. About five years before his admission, he struck his leg in the seat of the former injury; a sore in consequence formed, which remained open about four years, when the fungus began to arise from it, and gradually increased till it measured four inches across its base. I amputated the limb, and on examining it, found a greyish firm gelatinous substance, extending from the fungus to

* Museum of St. Bartholomew's Hospital, First series, Nos. 124, 125, Plate 15, fig. 1.

the subjacent periosteum, which was diseased in the manner already described.

V.—In the next case, the growth of a fungus from the front of the leg was the consequence of diseased actions in the periosteum and bone, which had been twenty-five years in progress. The disease commenced shortly after a laceration of the soft parts, with separation of the periosteum from the front of the tibia, for which the patient was under the care of Mr. Cruikshank. Through the long period of twenty five years, the leg had not been for a single month wholly free from pain. Small abscesses had repeatedly formed over the tibia, accompanied by numerous exfoliations from it. At length a fungus arose from the diseased parts; it was firm, not lobulated, presenting therefore less of the cauliflower-like appearance than in the preceding cases. I removed the limb, in accordance with the result of a consultation upon the case by Mr. Cline and Mr. Abernethy; and on examining it, I found the fungus extending to the periosteum, which, over the whole tibia, was soft and flocculent, and very readily separable from the bone. The tibia was enlarged by the increased thickness of its walls*.

VI.—In the case next related, the disease in the leg was consequent on a gun-shot wound, received at the siege of Flushing, thirty-three years before the amputation of the limb. The man stated that the ball penetrated the bone, from which, a few hours afterwards, it was extracted. Abscess and extensive exfoliation of the tibia ensued; and through the long period which had elapsed since the receipt of the injury, the leg had scarcely ever been perfectly free from pain. A broad and very soft fungus arose from the front of the tibia, and during the few months immediately preceding the removal of the limb, the man observed the bone to yield at the diseased part. On examining the limb, I found that the morbid growth had completely penetrated the shaft of the tibia, through about two inches of its length; and it was in this case, that Mr. Paget discovered in the morbid growth, the existence of scales like epithelial scales, similar to those which are found in carcinoma of the skin, consisting in degeneration of its tissue.

In the foregoing case, the man had long suffered from chronic bronchitis, which, after the amputation of the limb was aggravated, and upon this, an attack of pneumonia supervened, from which he sank. On examining the body, no morbid deposit was discovered in any of the

* Museum of St. Bartholomew's Hospital, First series, Nos. 75, 76.

internal organs; thus affording confirmation of the view which has been taken of this disease, that although malignant in its intractable nature, and in its tendency to spread into the deep structures of the limb, it is not likely to be followed by the development of similar disease elsewhere.

There can be, I apprehend, no difficulty in distinguishing the disease represented by the foregoing cases, from the old incurable ulcer upon the front of the tibia, the surface of which is formed by a layer of smooth and firm granulations, and the bone beneath which, is enlarged and indurated with, in many instances, a circumscribed deposit of osseous matter beneath the ulcer, and exactly of its figure and size. Consequent on the old ulcer of the leg, there is no destruction of the subjacent parts. But in the disease which has been here described, there is destruction of the tissues of the limb, including the bone, with a fungous growth from the diseased parts. Directly these characters are distinctly manifested, there can be no doubt of the propriety of removing the limb.

THE END.

BLANCHARD & LEA'S
MEDICAL AND SURGICAL PUBLICATIONS.

TO THE MEDICAL PROFESSION.

In the present catalogue we have affixed prices to our publications, in obedience to the repeated requests of numerous members of the profession. While books, like all other articles, must necessarily vary somewhat in cost throughout the extended territories of this country, yet our publications will generally be furnished at these rates by booksellers throughout the Union, who can readily and speedily procure any which they may not have on hand.

To accommodate those physicians who have not convenient access to bookstores, or who cannot order through merchants visiting the larger cities, we will forward our works by mail, *free of postage*, on receipt of the printed prices in current funds or postage stamps. As our business is wholesale, and we open accounts with booksellers only, the amount must in every case, without exception, accompany the order, and we can assume no risks of the mail, either on the money or the books; and as we only sell our own publications, we can supply no others. Physicians will, therefore, see the convenience and advantage of making their purchases, whenever practicable, from the nearest bookseller.

We can only add that no exertions are spared to merit a continuance of the gratifying confidence hitherto manifested by the profession in all works bearing our imprint.

BLANCHARD & LEA.

PHILADELPHIA, August, 1857.

*** We have now ready a new ILLUSTRATED CATALOGUE of our Medical and Scientific Publications, forming an octavo pamphlet of 80 large pages, containing specimens of illustrations, notices of the medical press, &c. &c. It has been prepared without regard to expense, and will be found one of the handsomest specimens of typographical execution as yet presented in this country. Copies will be sent to any address, by mail, free of postage, on receipt of nine cents in stamps.

Catalogues of our numerous publications in miscellaneous and educational literature forwarded on application.

TWO MEDICAL PERIODICALS, FREE OF POSTAGE,

FOR FIVE DOLLARS PER ANNUM.

THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, subject to postage, when not paid for in advance, - - - - - - - - $5 00

THE MEDICAL NEWS AND LIBRARY, invariably in advance, - - 1 00

or, BOTH PERIODICALS furnished, FREE OF POSTAGE, for Five Dollars remitted in advance.

THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES,

EDITED BY ISAAC HAYS, M. D.,

is published Quarterly, on the first of January, April, July, and October. Each number contains at least two hundred and eighty large octavo pages, handsomely and appropriately illustrated, wherever necessary. It has now been issued regularly for more than THIRTY-FIVE years, and it has been under the control of the present editor for more than a quarter of a century. Throughout this long period, it has maintained its position in the highest rank of medical periodicals both at home and abroad, and has received the cordial support of the entire profession in this country. Its list of Collaborators will be found to contain a large number of the most distinguished names of the profession in every section of the United States, rendering the department devoted to

ORIGINAL COMMUNICATIONS

full of varied and important matter, of great interest to all practitioners.

As the aim of the Journal, however, is to combine the advantages presented by all the different varieties of periodicals, in its

REVIEW DEPARTMENT

will be found extended and impartial reviews of all important new works, presenting subjects of novelty and interest, together with very numerous

BIBLIOGRAPHICAL NOTICES,

including nearly all the medical publications of the day, both in this country and Great Britain, with a choice selection of the more important continental works. This is followed by the

QUARTERLY SUMMARY,

being a very full and complete abstract, methodically arranged, of the

IMPROVEMENTS AND DISCOVERIES IN THE MEDICAL SCIENCES.

This department of the Journal, so important to the practising physician, is the object of especial care on the part of the editor. It is classified and arranged under different heads, thus facilitating the researches of the reader in pursuit of particular subjects, and will be found to present a very full and accurate digest of all observations, discoveries, and inventions recorded in every branch of medical science. The very extensive arrangements of the publishers are such as to afford to the editor complete materials for this purpose, as he not only regularly receives

ALL THE AMERICAN MEDICAL AND SCIENTIFIC PERIODICALS,

but also twenty or thirty of the more important Journals issued in Great Britain and on the Continent, thus enabling him to present in a convenient compass a thorough and complete abstract of everything interesting or important to the physician occurring in any part of the civilized world.

To their old subscribers, many of whom have been on their list for twenty or thirty years, the publishers feel that no promises for the future are necessary; but those who may desire for the first time to subscribe, can rest assured that no exertion will be spared to maintain the Journal in the high position which it has occupied for so long a period.

By reference to the terms it will be seen that, in addition to this large amount of valuable and practical information on every branch of medical science, the subscriber, by paying in advance, becomes entitled, without further charge, to

THE MEDICAL NEWS AND LIBRARY,

a monthly periodical of thirty-two large octavo pages. Its "News Department" presents the current information of the day, while the "Library Department" is devoted to presenting standard works on various branches of medicine. Within a few years, subscribers have thus received, without expense, the following works which have passed through its columns:—

WATSON'S LECTURES ON THE PRACTICE OF PHYSIC.
BRODIE'S CLINICAL LECTURES ON SURGERY.
TODD AND BOWMAN'S PHYSIOLOGICAL ANATOMY AND PHYSIOLOGY OF MAN.
WEST'S LECTURES ON THE DISEASES OF INFANCY AND CHILDHOOD.
MALGAIGNE'S OPERATIVE SURGERY, with wood-cuts.
SIMON'S LECTURES ON GENERAL PATHOLOGY.
BENNETT ON PULMONARY TUBERCULOSIS, with wood-cuts,
WEST ON ULCERATION OF THE OS UTERI, and
BROWN ON THE SURGICAL DISEASES OF FEMALES, with wood-cuts.

While in the number for July, 1856, was commenced a new and highly important work, which is continued throughout 1857.

WEST'S LECTURES ON THE DISEASES OF WOMEN.

The very favorable reception accorded by the profession to the valuable "Lectures on the Diseases of Children," by the same author, which likewise appeared in this periodical, has induced the publishers to secure the present work for their subscribers, from advance sheets, supplied by the author. The very high reputation of Dr. West, and the unusual clinical advantages which he has enjoyed, sufficiently indicate the practical value of a systematic work from his pen on so important a subject. The publishers, therefore, trust that its appearance in the "News" will afford entire satisfaction to their numerous subscribers, who will thus receive it free of all expense.

☞ For a more extended advertisement, see p. 32.

It will thus be seen that for the small sum of FIVE DOLLARS, paid in advance, the subscriber will obtain a Quarterly and a Monthly periodical,

EMBRACING ABOUT FIFTEEN HUNDRED LARGE OCTAVO PAGES,

mailed to any part of the United States, free of postage.

These very favorable terms are now presented by the publishers with the view of removing all difficulties and objections to a full and extended circulation of the Medical Journal to the office of every member of the profession throughout the United States. The rapid extension of mail facilities will now place the numbers before subscribers with a certainty and dispatch not heretofore attainable; while by the system now proposed, every subscriber throughout the Union is placed upon an equal footing, at the very reasonable price of Five Dollars for two periodicals, without further expense.

Those subscribers who do not pay in advance will bear in mind that their subscription of Five Dollars will entitle them to the Journal only, without the News, and that they will be at the expense of their own postage on the receipt of each number. The advantage of a remittance when ordering the Journal will thus be apparent.

As the Medical News and Library is in no case sent without advance payment, its subscribers will always receive it free of postage.

Remittances of subscriptions can be mailed at our risk, when a certificate is taken from the Postmaster that the money is duly inclosed and forwarded.

Address BLANCHARD & LEA, Philadelphia.

ALLEN (J. M.), M. D.,

Professor of Anatomy in the Pennsylvania Medical College, &c.

THE PRACTICAL ANATOMIST; or, The Student's Guide in the Dissecting-ROOM. With 266 illustrations. In one handsome royal 12mo. volume, of over 600 pages, leather. $2 25. (*Now Ready.*)

In the arrangement of this work, the author has endeavored to present a complete and thorough course of dissections in a clearer and more available form for practical use, than has as yet been accomplished. The chapters follow each other in the order in which dissections are usually conducted in this country, and as each region is taken up, every detail regarding it is fully described and illustrated, so that the student is not interrupted in his labors, by the necessity of referring from one portion of the volume to another.

However valuable may be the "Dissector's Guides" which we, of late, have had occasion to notice, we feel confident that the work of Dr. Allen is superior to any of them. We believe with the author, that none is so fully illustrated as this, and the arrangement of the work is such as to facilitate the labors of the student in acquiring a thorough practical knowledge of Anatomy. We most cordially recommend it to their attention.—*Western Lancet*, Dec. 1856.

We believe it to be one of the most useful works upon the subject ever written. It is handsomely illustrated, well printed, and will be found of convenient size for use in the dissecting-room.—*Med. Examiner*, Dec. 1856.

From Prof. J. S. Davis, University of Va.

I am not acquainted with any work that attains so fully the object which it proposes.

From C. P. Fanner, M. D., Demonstrator, University of Michigan.

I have examined the work briefly, but even this examination has convinced me that it is an excellent guide for the Dissector. Its illustrations are beautiful, and more than I have seen in a work of this kind. I shall take great pleasure in recommending it to my classes as *the text-book of the dissecting-room.*

ANALYTICAL COMPENDIUM

OF MEDICAL SCIENCE, containing Anatomy, Physiology, Surgery, Midwifery, Chemistry, Materia Medica, Therapeutics, and Practice of Medicine. By JOHN NEILL, M. D., and F. G. SMITH, M. D. New and enlarged edition, one thick volume royal 12mo. of over 1000 pages, with 374 illustrations. ☞ See NEILL, p. 24.

ABEL (F. A.), F. C. S. AND C. L. BLOXAM.

HANDBOOK OF CHEMISTRY, Theoretical, Practical, and Technical; with a Recommendatory Preface by Dr. HOFMANN. In one large octavo volume, extra cloth, of 662 pages, with illustrations. $3 25.

It must be understood that this is a work fitted for the earnest student, who resolves to pursue for himself a steady search into the chemical mysteries of creation. For such a student the 'Handbook' will prove an excellent guide, since he will find in it, not merely the approved modes of analytical investigation, but most descriptions of the apparatus necessary, with such manipulatory details as rendered Faraday's 'Chemical Manipulations' so valuable at the time of its publication. Beyond this, the importance of the work is increased by the introduction of much of the technical chemistry of the manufactory.—*Dr. Hofmann's Preface.*

ASHWELL (SAMUEL), M. D.,

Obstetric Physician and Lecturer to Guy's Hospital, London.

A PRACTICAL TREATISE ON THE DISEASES PECULIAR TO WOMEN. Illustrated by Cases derived from Hospital and Private Practice. Third American, from the Third and revised London edition. In one octavo volume, extra cloth, of 528 pages. $3 00.

The most useful practical work on the subject in the English language.—*Boston Med. and Surg. Journal.*

The most able, and certainly the most standard and practical, work on female diseases that we have yet seen.—*Medico-Chirurgical Review.*

ARNOTT (NEILL), M. D.

ELEMENTS OF PHYSICS; or Natural Philosophy, General and Medical. Written for universal use, in plain or non-technical language. A new edition, by ISAAC HAYS, M. D. Complete in one octavo volume, leather, of 484 pages, with about two hundred illustrations. $2 50.

BUDD (GEORGE), M. D., F. R. S.,

Professor of Medicine in King's College, London.

ON DISEASES OF THE LIVER. Second American, from the second and enlarged London edition. In one very handsome octavo volume, extra cloth, with four beautifully colored plates, and numerous wood-cuts. pp. 468. $3 00.

For many years, Dr. Budd's work must be the authority of the great mass of British practitioners on the hepatic diseases; and it is satisfactory that the subject has been taken up by so able and experienced a physician.—*British and Foreign Medico-Chirurgical Review.*

BY THE SAME AUTHOR.

ON THE ORGANIC DISEASES AND FUNCTIONAL DISORDERS OF THE STOMACH. In one neat octavo volume, extra cloth. $1 50.

From the high position occupied by Dr. Budd as a teacher, a writer, and a practitioner, it is almost needless to state that the present book may be consulted with great advantage. It is written in an easy style, the subjects are well arranged, and the practical precepts, both of diagnosis and treatment, denote the character of a thoughtful and experienced physician.—*London Med. Times and Gazette*, Dec. 1855.

BROWN (ISAAC BAKER),

Surgeon-Accoucheur to St. Mary's Hospital, &c.

ON SOME DISEASES OF WOMEN ADMITTING OF SURGICAL TREATMENT.

With handsome illustrations. One vol. 8vo., extra cloth. (*Now Ready.*) $1 60.

Mr. Brown has earned for himself a high reputation in the operative treatment of sundry diseases and injuries to which females are peculiarly subject. We can truly say of his work that it is an important addition to obstetrical literature. The operative suggestions and contrivances which Mr. Brown describes, exhibit much practical sagacity and skill, and merit the careful attention of every surgeon-accoucheur.—*Association Journal.*

We have no hesitation in recommending this book to the careful attention of all surgeons who make female complaints a part of their study and practice. —*Dublin Quarterly Journal.*

BENNETT (J. HUGHES), M. D., F. R. S. E.,

Professor of Clinical Medicine in the University of Edinburgh, &c.

THE PATHOLOGY AND TREATMENT OF PULMONARY TUBERCULOSIS,

and on the Local Medication of Pharyngeal and Laryngeal Diseases frequently mistaken for or associated with, Phthisis. In one handsome octavo volume, extra cloth, with beautiful wood-cuts. pp. 130. (*Lately Issued.*) $1 25.

BENNETT (HENRY), M. D.

A PRACTICAL TREATISE ON INFLAMMATION OF THE UTERUS,

ITS CERVIX AND APPENDAGES, and on its connection with Uterine Disease. Fourth American, from the third and revised London edition. To which is added (*July*, 1856), a REVIEW OF THE PRESENT STATE OF UTERINE PATHOLOGY. In one neat octavo volume, extra cloth, of 500 pages, with wood-cuts. $2 00.

The addition of the "REVIEW" presents the most recent aspects of the questions discussed in this well-known work, bringing it down to the latest moment.

This edition has been carefully revised and altered, and various additions have been made, which render it more complete, and, if possible, more worthy of the high appreciation in which it is held by the medical profession throughout the world. A copy should be in the possession of every physician.—*Charleston Med. Journal and Review.*

We are firmly of opinion that in proportion as a knowledge of uterine diseases becomes more appreciated, this work will be proportionably established as a text-book in the profession.—*The Lancet.*

When, a few years back, the first edition of the present work was published, the subject was one almost entirely unknown to the obstetrical celebrities of the day; and even now we have reason to know that the bulk of the profession are not fully alive to the importance and frequency of the disease of which it takes cognizance. The present edition is so much enlarged, altered, and improved, that it can scarcely be considered the same work.—*Dr. Ranking's Abstract.*

ALSO, FOR SALE SEPARATE,

A REVIEW OF THE PRESENT STATE OF UTERINE PATHOLOGY.

1 small vol. 8vo. 50 cents.

BIRD (GOLDING), A. M., M. D., &c.

URINARY DEPOSITS: THEIR DIAGNOSIS, PATHOLOGY, AND THERAPEUTICAL INDICATIONS.

A new and enlarged American, from the last improved London edition. With over sixty illustrations. In one royal 12mo. vol, extra cloth. pp. 372. $1 30.

It can scarcely be necessary for us to say anything of the merits of this well-known Treatise, which so admirably brings into practical application the results of those microscopical and chemical researches regarding the physiology and pathology of the urinary secretion, which have contributed so much to the increase of our diagnostic powers, and to the extension and satisfactory employment of our therapeutic resources. In the preparation of this new edition of his work, it is obvious that Dr. Golding Bird has spared no pains to render it a faithful representation of the present state of scientific knowledge on the subject it embraces.—*The British and Foreign Medico-Chirurgical Review.*

BY THE SAME AUTHOR.

ELEMENTS OF NATURAL PHILOSOPHY;

being an Experimental Introduction to the Physical Sciences. Illustrated with nearly four hundred wood-cuts. From the third London edition. In one neat volume, royal 12mo., extra cloth. pp. 402. $1 25.

BLAKISTON'S PRACTICAL OBSERVATIONS ON CERTAIN DISEASES OF THE CHEST, and on the Principles of Auscultation. In one vol., cloth, 8vo. pp. 384. $1 25.

BURROWS ON DISORDERS OF THE CEREBRAL CIRCULATION, and on the Connection between the Affections of the Brain and Diseases of the Heart. In one 8vo. vol., extra cloth, with colored plates. pp. 216. $1 25.

BEALE ON THE LAWS OF HEALTH IN RELATION TO MIND AND BODY. A Series of Letters from an old Practitioner to a Patient. In one volume, royal 12mo., extra cloth. pp. 296. 80 cents.

BUSHNAN'S PHYSIOLOGY OF ANIMAL AND VEGETABLE LIFE; a Popular Treatise on the Functions and Phenomena of Organic Life. In one handsome royal 12mo. volume, extra cloth, with over 100 illustrations. pp. 234. 80 cents.

BUCKLER ON THE ETIOLOGY, PATHOLOGY, AND TREATMENT OF FIBRO-BRONCHITIS AND RHEUMATIC PNEUMONIA. In one 8vo. volume, extra cloth. pp. 150. $1 25.

BLOOD AND URINE (MANUALS ON). BY JOHN WILLIAM GRIFFITH, G. OWEN REESE, AND ALFRED MARKWICK. One thick volume, royal 12mo., extra cloth, with plates. pp. 460. $1 25.

BRODIE'S CLINICAL LECTURES ON SURGERY. 1 vol. 8vo., cloth. 350 pp. $1 25.

BARLOW (GEORGE H.), M. D.

Physician to Guy's Hospital, London, &c.

A MANUAL OF THE PRACTICE OF MEDICINE. With Additions by D. F. Condie, M. D., author of "A Practical Treatise on Diseases of Children," &c. In one handsome octavo volume, leather, of over 600 pages. (*A new work, just issued*, 1856.) $2 75.

We most emphatically commend it to the attention of the profession, as deserving their confidence—a depository of practical knowledge, from which they may draw with great benefit.—*Cincinnati Med. Observer*, Mar. 1856.

The student has long been in want of a good elementary work on the Practice of Medicine. In Dr. Barlow's Manual that want is supplied; and we have no question that it will at once be installed as the favorite text-book in all Medical Schools.—*Medical Times and Gazette.*

We recommend Dr. Barlow's Manual in the warmest manner as a most valuable vade-mecum. We have had frequent occasion to consult it, and have found it clear, concise, practical, and sound. It is eminently a practical work, containing all that is essential, and avoiding useless theoretical discussion. The work supplies what has been for some time wanting, a manual of practice based upon modern discoveries in pathology and rational views of treatment of disease. It is especially intended for the use of students and junior practitioners, but it will be found hardly less useful to the experienced physician. The American editor has added to the work three chapters—on Cholera Infantum, Yellow Fever, and Cerebro-spinal Meningitis. These additions, the two first of which are indispensable to a work on practice destined for the profession in this country, are executed with great judgment and fidelity, by Dr. Condie, who has also succeeded happily in imitating the conciseness and clearness of style which are such agreeable characteristics of the original book.—*Boston Med. and Surg. Journal.*

BARTLETT (ELISHA), M. D.

THE HISTORY, DIAGNOSIS, AND TREATMENT OF THE FEVERS OF THE UNITED STATES. A new and revised edition. By Alonzo Clark, M. D., Prof. of Pathology and Practical Medicine in the N. Y. College of Physicians and Surgeons, &c. In one octavo volume, of six hundred pages, extra cloth. (*Now Ready.*) Price $3 00.

The position which this work has obtained as one of our medical classics, renders unnecessary any remark further than to say that the editor, in executing the task assigned to him by the late author, has endeavored to render the work a faithful exposition of the subject in its most advanced condition. To effect this, a considerable amount of matter has been introduced, but by a slight enlargement of the page it has been accommodated without unduly increasing the bulk of the volume. The reputation of the editor as an accurate observer and philosophical writer is sufficient guarantee that, in his hands, the work will fully maintain its former character.

It is the best work on fevers which has emanated from the American press, and the present editor has carefully availed himself of all information existing upon the subject in the Old and New World, so that the doctrines advanced are brought down to the latest date in the progress of this department of Medical Science.—*London Med. Times and Gazette*, May 2, 1857.

This excellent monograph on febrile disease, has stood deservedly high since its first publication. It will be seen that it has now reached its fourth edition under the supervision of Prof. A. Clark, a gentleman who, from the nature of his studies and pursuits, is well calculated to appreciate and discuss the many intricate and difficult questions in pathology. His annotations add much to the interest of the work, and have brought it well up to the condition of the science as it exists at the present day in regard to this class of diseases.—*Southern Med. and Surg. Journal*, Mar. 1857.

It is a work of great practical value and interest, containing much that is new relative to the several diseases of which it treats, and, with the additions of the editor, is fully up to the times. The distinctive features of the different forms of fever are plainly and forcibly portrayed, and the lines of demarcation carefully and accurately drawn, and to the American practitioner is a more valuable and safe guide than any work on fever extant.—*Ohio Med. and Surg. Journal*, May, 1857.

The plan of the work is exceedingly compact and comprehensive. The style of the author is clear, his reasoning logical, and his deductions philosophical, while the spirit that pervades the work is, in the main, unexceptionable. The frequent additions by the editor, are what might be looked for from their distinguished source, able, judicious, and timely. We heartily commend it to the attention of our readers as the only work on fevers that is fully adapted to this country and climate. We predict for the present edition even a more rapid sale than the former ones.—*N. J. Med. Reporter*, Mar. 1857.

BOWMAN (JOHN E.), M. D.

PRACTICAL HANDBOOK OF MEDICAL CHEMISTRY. Second American, from the third and revised English Edition. In one neat volume, royal 12mo., extra cloth, with numerous illustrations. pp. 288. $1 25.

BY THE SAME AUTHOR.

INTRODUCTION TO PRACTICAL CHEMISTRY, INCLUDING ANALYSIS. Second American, from the second and revised London edition. With numerous illustrations. In one neat vol., royal 12mo., extra cloth. pp. 350. $1 25.

CURLING (T. B.), F. R. S.,

Surgeon to the London Hospital, President of the Hunterian Society, &c.

A PRACTICAL TREATISE ON DISEASES OF THE TESTIS, SPERMATIC CORD, AND SCROTUM. Second American, from the second and enlarged English edition. In one handsome octavo volume, extra cloth, with numerous illustrations. pp. 420. (*Just Issued*, 1856.) $2 00.

In the revised English edition, of which this is a reprint, the author, for want of space, omitted the Anatomical Introduction. By a more condensed style of printing, room has been found in the present volume to retain this important portion without rendering the work inconveniently large. Some of the notes of the former American editor have also been incorporated, and a number of new illustrations introduced. With these improvements, and the thorough revision which it has enjoyed at the hands of the author, it will be found fully worthy to retain the authoritative position which it has acquired with regard to this class of affections.

CARPENTER (WILLIAM B.), M. D., F. R. S., &c.,

Examiner in Physiology and Comparative Anatomy in the University of London.

PRINCIPLES OF HUMAN PHYSIOLOGY; with their chief applications to

Psychology, Pathology, Therapeutics, Hygiene, and Forensic Medicine. A new American, from the last and revised London edition. With nearly three hundred illustrations. Edited, with additions, by FRANCIS GURNEY SMITH, M. D., Professor of the Institutes of Medicine in the Pennsylvania Medical College, &c. In one very large and beautiful octavo volume, of about nine hundred large pages, handsomely printed and strongly bound in leather, with raised bands. (*Just Issued*, 1856.) $4 25.

In the preparation of this new edition, the author has spared no labor to render it, as heretofore, a complete and lucid exposition of the most advanced condition of its important subject. The amount of the additions required to effect this object thoroughly, joined to the former large size of the volume, presenting objections arising from the unwieldy bulk of the work, he has omitted all those portions not bearing directly upon HUMAN PHYSIOLOGY, designing to incorporate them in his forthcoming Treatise on GENERAL PHYSIOLOGY. As a full and accurate text-book on the Physiology of Man, the work in its present condition therefore presents even greater claims upon the student and physician than those which have heretofore won for it the very wide and distinguished favor which it has so long enjoyed. The additions of Prof. Smith will be found to supply whatever may have been wanting to the American student, while the introduction of many new illustrations, and the most careful mechanical execution, render the volume one of the most attractive as yet issued.

For upwards of thirteen years Dr. Carpenter's work has been considered by the profession generally, both in this country and England, as the most valuable compendium on the subject of physiology in our language. This distinction it owes to the high attainments and unwearied industry of its accomplished author. The present edition (which, like the last American one, was prepared by the author himself), is the result of such extensive revision, that it may almost be considered a new work. We need hardly say, in concluding this brief notice, that while the work is indispensable to every student of medicine in this country, it will amply repay the practitioner for its perusal by the interest and value of its contents.—*Boston Med. and Surg. Journal.*

This is a standard work—the text-book used by all medical students who read the English language. It has passed through several editions in order to keep pace with the rapidly growing science of Physiology. Nothing need be said in its praise, for its merits are universally known; we have nothing to say of its defects, for they only appear where the science of which it treats is incomplete.—*Western Lancet.*

The most complete exposition of physiology which any language can at present give.—*Brit. and For. Med.-Chirurg. Review.*

The greatest, the most reliable, and the best book on the subject which we know of in the English language.—*Stethoscope.*

To eulogize this great work would be superfluous We should observe, however, that in this edition the author has remodelled a large portion of the former, and the editor has added much matter of interest, especially in the form of illustrations. We may confidently recommend it as the most complete work on Human Physiology in our language.—*Southern Med. and Surg. Journal*, December, 1855.

The most complete work on the science in our language.—*Am. Med. Journal.*

The most complete work now extant in our language.—*N. O. Med. Register.*

The best text-book in the language on this extensive subject.—*London Med. Times.*

A complete cyclopædia of this branch of science.—*N. Y. Med. Times.*

The profession of this country, and perhaps also of Europe, have anxiously and for some time awaited the announcement of this new edition of Carpenter's Human Physiology. His former editions have for many years been almost the only text-book on Physiology in all our medical schools, and its circulation among the profession has been unsurpassed by any work in any department of medical science.

It is quite unnecessary for us to speak of this work as its merits would justify. The mere announcement of its appearance will afford the highest pleasure to every student of Physiology, while its perusal will be of infinite service in advancing physiological science.—*Ohio Med. and Surg. Journ.*

BY THE SAME AUTHOR. (*Lately Issued.*)

PRINCIPLES OF COMPARATIVE PHYSIOLOGY. New American, from

the Fourth and Revised London edition. In one large and handsome octavo volume, with over three hundred beautiful illustrations. pp. 752. Extra cloth, $4 80; leather, raised bands, $5 25.

The delay which has existed in the appearance of this work has been caused by the very thorough revision and remodelling which it has undergone at the hands of the author, and the large number of new illustrations which have been prepared for it. It will, therefore, be found almost a new work, and fully up to the day in every department of the subject, rendering it a reliable text-book for all students engaged in this branch of science. Every effort has been made to render its typographical finish and mechanical execution worthy of its exalted reputation, and creditable to the mechanical arts of this country.

This book should not only be read but thoroughly studied by every member of the profession. None are too wise or old, to be benefited thereby. But especially to the younger class would we cordially commend it as best fitted of any work in the English language to qualify them for the reception and comprehension of those truths which are daily being developed in physiology.—*Medical Counsellor.*

Without pretending to it, it is an encyclopedia of the subject, accurate and complete in all respects—a truthful reflection of the advanced state at which the science has now arrived.—*Dublin Quarterly Journal of Medical Science.*

A truly magnificent work—in itself a perfect physiological study.—*Ranking's Abstract.*

This work stands without its fellow. It is one few men in Europe could have undertaken; it is one no man, we believe, could have brought to so successful an issue as Dr. Carpenter. It required for its production a physiologist at once deeply read in the labors of others, capable of taking a general, critical, and unprejudiced view of those labors, and of combining the varied, heterogeneous materials at his disposal, so as to form an harmonious whole. We feel that this abstract can give the reader a very imperfect idea of the fulness of this work, and no idea of its unity, of the admirable manner in which material has been brought, from the most various sources, to conduce to its completeness, of the lucidity of the reasoning it contains, or of the clearness of language in which the whole is clothed. Not the profession only, but the scientific world at large, must feel deeply indebted to Dr. Carpenter for this great work. It must, indeed, add largely even to his high reputation.—*Medical Times.*

CARPENTER (WILLIAM B.), M. D., F. R. S.,

Examiner in Physiology and Comparative Anatomy in the University of London.

(*Just Issued*, 1856.)

THE MICROSCOPE AND ITS REVELATIONS.

With an Appendix containing the Applications of the Microscope to Clinical Medicine, &c. By F. G. Smith, M. D. Illustrated by four hundred and thirty-four beautiful engravings on wood. In one large and very handsome octavo volume, of 724 pages, extra cloth, $4 00; leather, $4 50.

Dr. Carpenter's position as a microscopist and physiologist, and his great experience as a teacher eminently qualify him to produce what has long been wanted—a good text-book on the practical use of the microscope. In the present volume his object has been, as stated in his Preface, "to combine, within a moderate compass, that information with regard to the use of his 'tools,' which is most essential to the working microscopist, with such an account of the objects best fitted for his study, as might qualify him to comprehend what he observes, and might thus prepare him to benefit science, whilst expanding and refreshing his own mind" That he has succeeded in accomplishing this, no one acquainted with his previous labors can doubt.

The great importance of the microscope as a means of diagnosis, and the number of microscopists who are also physicians, have induced the American publishers, with the author's approval, to add an Appendix, carefully prepared by Professor Smith, on the applications of the instrument to clinical medicine, together with an account of American Microscopes, their modifications and accessories. This portion of the work is illustrated with nearly one hundred wood-cuts, and, it is hoped, will adapt the volume more particularly to the use of the American student.

Every care has been taken in the mechanical execution of the work, which is confidently presented as in no respect inferior to the choicest productions of the London press.

The mode in which the author has executed his intentions may be gathered from the following condensed synopsis of the

CONTENTS.

Introduction—History of the Microscope. Chap. I. Optical Principles of the Microscope. Chap. II. Construction of the Microscope. Chap. III. Accessory Apparatus. Chap. IV. Management of the Microscope Chap. V. Preparation, Mounting, and Collection of Objects. Chap. VI. Microscopic Forms of Vegetable Life—Protophytes. Chap. VII. Higher Cryptogamia. Chap. VIII. Phanerogamic Plants. Chap. IX. Microscopic Forms of Animal Life—Protozoa—Animalcules. Chap. X. Foraminifera, Polycystina, and Sponges. Chap. XI. Zoophytes. Chap. XII. Echinodermata. Chap. XIII. Polyzoa and Compound Tunicata. Chap. XIV. Molluscous Animals Generally. Chap. XV. Annulosa. Chap. XVI. Crustacea. Chap. XVII. Insects and Arachnida. Chap. XVIII. Vertebrated Animals. Chap. XIX. Applications of the Microscope to Geology. Chap. XX. Inorganic or Mineral Kingdom—Polarization. Appendix. Microscope as a means of Diagnosis—Injections—Microscopes of American Manufacture.

Those who are acquainted with Dr. Carpenter's previous writings on Animal and Vegetable Physiology, will fully understand how vast a store of knowledge he is able to bring to bear upon so comprehensive a subject as the revelations of the microscope; and even those who have no previous acquaintance with the construction or uses of this instrument, will find abundance of information conveyed in clear and simple language.—*Med. Times and Gazette.*

Although originally not intended as a strictly medical work, the additions by Prof. Smith give it a positive claim upon the profession, for which we doubt not he will receive their sincere thanks. Indeed, we know not where the student of medicine will find such a complete and satisfactory collection of microscopic facts bearing upon physiology and practical medicine as is contained in Prof. Smith's appendix; and this of itself, it seems to us, is fully worth the cost of the volume.—*Louisville Medical Review*, Nov. 1856.

BY THE SAME AUTHOR.

ELEMENTS (OR MANUAL) OF PHYSIOLOGY, INCLUDING PHYSIOLOGICAL ANATOMY.

Second American, from a new and revised London edition. With one hundred and ninety illustrations. In one very handsome octavo volume, leather. pp. 566. $3 00.

In publishing the first edition of this work, its title was altered from that of the London volume, by the substitution of the word "Elements" for that of "Manual," and with the author's sanction the title of "Elements" is still retained as being more expressive of the scope of the treatise.

To say that it is the best manual of Physiology now before the public, would not do sufficient justice to the author.—*Buffalo Medical Journal.*

In his former works it would seem that he had exhausted the subject of Physiology. In the present, he gives the essence, as it were, of the whole.—*N. Y. Journal of Medicine.*

Those who have occasion for an elementary treatise on Physiology, cannot do better than to possess themselves of the manual of Dr. Carpenter.—*Medical Examiner.*

The best and most complete exposé of modern Physiology, in one volume, extant in the English language.—*St. Louis Medical Journal.*

BY THE SAME AUTHOR. (*Preparing.*)

PRINCIPLES OF GENERAL PHYSIOLOGY, INCLUDING ORGANIC CHEMISTRY AND HISTOLOGY.

With a General Sketch of the Vegetable and Animal Kingdom. In one large and very handsome octavo volume, with several hundred illustrations.

The subject of general physiology having been omitted in the last editions of the author's "Comparative Physiology" and "Human Physiology," he has undertaken to prepare a volume which shall present it more thoroughly and fully than has yet been attempted, and which may be regarded as an introduction to his other works.

BY THE SAME AUTHOR.

A PRIZE ESSAY ON THE USE OF ALCOHOLIC LIQUORS IN HEALTH AND DISEASE.

New edition, with a Preface by D. F. Condie, M. D., and explanations of scientific words. In one neat 12mo. volume, extra cloth. pp. 178. 50 cents.

CONDIE (D. F.), M. D., &c.

A PRACTICAL TREATISE ON THE DISEASES OF CHILDREN. Fourth edition, revised and augmented. In one large volume, 8vo., leather, of nearly 750 pages. $3 00.

FROM THE AUTHOR'S PREFACE.

The demand for another edition has afforded the author an opportunity of again subjecting the entire treatise to a careful revision, and of incorporating in it every important observation recorded since the appearance of the last edition, in reference to the pathology and therapeutics of the several diseases of which it treats.

In the preparation of the present edition, as in those which have preceded, while the author has appropriated to his use every important fact that he has found recorded in the works of others, having a direct bearing upon either of the subjects of which he treats, and the numerous valuable observations—pathological as well as practical—dispersed throughout the pages of the medical journals of Europe and America, he has, nevertheless, relied chiefly upon his own observations and experience, acquired during a long and somewhat extensive practice, and under circumstances peculiarly well adapted for the clinical study of the diseases of early life.

Every species of hypothetical reasoning has, as much as possible, been avoided. The author has endeavored throughout the work to confine himself to a simple statement of well-ascertained pathological facts, and plain therapeutical directions—his chief desire being to render it what its title imports it to be, A PRACTICAL TREATISE ON THE DISEASES OF CHILDREN.

Dr. Condie's scholarship, acumen, industry, and practical sense are manifested in this, as in all his numerous contributions to science.—*Dr. Holmes's Report to the American Medical Association.*

Taken as a whole, in our judgment, Dr. Condie's Treatise is the one from the perusal of which the practitioner in this country will rise with the greatest satisfaction.—*Western Journal of Medicine and Surgery.*

One of the best works upon the Diseases of Children in the English language.—*Western Lancet.*

Perhaps the most full and complete work now before the profession of the United States; indeed, we may say in the English language. It is vastly superior to most of its predecessors.—*Transylvania Med. Journal.*

We feel assured from actual experience that no physician's library can be complete without a copy of this work.—*N. Y. Journal of Medicine.*

A veritable pædiatric encyclopædia, and an honor to American medical literature.—*Ohio Medical and Surgical Journal.*

We feel persuaded that the American medical profession will soon regard it not only as a very good, but as the VERY BEST "Practical Treatise on the Diseases of Children."—*American Medical Journal.*

We pronounced the first edition to be the best work on the diseases of children in the English language, and, notwithstanding all that has been published, we still regard it in that light.—*Medical Examiner.*

CHRISTISON (ROBERT), M. D., V. P. R. S. E., &c.

A DISPENSATORY; or, Commentary on the Pharmacopœias of Great Britain and the United States; comprising the Natural History, Description, Chemistry, Pharmacy, Actions, Uses, and Doses of the Articles of the Materia Medica. Second edition, revised and improved, with a Supplement containing the most important New Remedies. With copious Additions, and two hundred and thirteen large wood-engravings. By R. EGLESFELD GRIFFITH, M. D. In one very large and handsome octavo volume, leather, raised bands, of over 1000 pages. $3 50.

It is not needful that we should compare it with the other pharmacopœias extant, which enjoy and merit the confidence of the profession: it is enough to say that it appears to us as perfect as a Dispensatory, in the present state of pharmaceutical science, could be made. If it omits any details pertaining to this branch of knowledge which the student has a right to expect in such a work, we confess the omission has escaped our scrutiny. We cordially recommend this work to such of our readers as are in need of a Dispensatory. They cannot make choice of a better.—*Western Journ. of Medicine and Surgery.*

COOPER (BRANSBY B.), F. R. S.

LECTURES ON THE PRINCIPLES AND PRACTICE OF SURGERY. In one very large octavo volume, extra cloth, of 750 pages. $3 00.

COOPER ON DISLOCATIONS AND FRACTURES OF THE JOINTS.—Edited by BRANSBY B. COOPER, F. R. S., &c. With additional Observations by Prof. J. C. WARREN. A new American edition. In one handsome octavo volume, extra cloth, of about 500 pages, with numerous illustrations on wood. $3 25.

COOPER ON THE ANATOMY AND DISEASES OF THE BREAST, with twenty-five Miscellaneous and Surgical Papers. One large volume, imperial 8vo., extra cloth, with 252 figures, on 36 plates. $2 50.

COOPER ON THE STRUCTURE AND DISEASES OF THE TESTIS, AND ON THE THYMUS GLAND. One vol. imperial 8vo., extra cloth, with 177 figures on 29 plates. $2 00.

COPLAND ON THE CAUSES, NATURE, AND TREATMENT OF PALSY AND APOPLEXY. In one volume, royal 12mo., extra cloth. pp. 326. 80 cents.

CLYMER ON FEVERS; THEIR DIAGNOSIS, PATHOLOGY, AND TREATMENT In one octavo volume, leather, of 600 pages. $1 50.

COLOMBAT DE L'ISERE ON THE DISEASES OF FEMALES, and on the special Hygiene of their Sex. Translated, with many Notes and Additions, by C. D. MEIGS, M. D. Second edition, revised and improved. In one large volume, octavo, leather, with numerous wood-cuts. pp. 720. $3 50.

CARSON (JOSEPH), M. D.,

Professor of Materia Medica and Pharmacy in the University of Pennsylvania.

SYNOPSIS OF THE COURSE OF LECTURES ON MATERIA MEDICA AND PHARMACY, delivered in the University of Pennsylvania. Second and revised edition. In one very neat octavo volume, extra cloth, of 208 pages. (*Now Ready.*) $1 50.

CHURCHILL (FLEETWOOD), M. D., M. R. I. A.

ON THE THEORY AND PRACTICE OF MIDWIFERY. A new American, from the last and improved English edition. Edited, with Notes and Additions, by D. Francis Condie, M. D., author of a "Practical Treatise on the Diseases of Children," &c. With 139 illustrations. In one very handsome octavo volume, leather. pp. 510. $3 00.

To bestow praise on a book that has received such marked approbation would be superfluous. We need only say, therefore, that if the first edition was thought worthy of a favorable reception by the medical public, we can confidently affirm that this will be found much more so. The lecturer, the practitioner, and the student, may all have recourse to its pages, and derive from their perusal much interest and instruction in everything relating to theoretical and practical midwifery.—*Dublin Quarterly Journal of Medical Science.*

A work of very great merit, and such as we can confidently recommend to the study of every obstetric practitioner.—*London Medical Gazette.*

This is certainly the most perfect system extant. It is the best adapted for the purposes of a text-book, and that which he whose necessities confine him to one book, should select in preference to all others.—*Southern Medical and Surgical Journal.*

The most popular work on midwifery ever issued from the American press.—*Charleston Med. Journal.*

Were we reduced to the necessity of having but *one* work on midwifery, and *permitted to choose*, we would unhesitatingly take Churchill.—*Western Med. and Surg. Journal.*

It is impossible to conceive a more useful and elegant manual than Dr. Churchill's Practice of Midwifery.—*Provincial Medical Journal.*

Certainly, in our opinion, the very best work on the subject which exists.—*N. Y. Annalist.*

No work holds a higher position, or is more deserving of being placed in the hands of the tyro, the advanced student, or the practitioner.—*Medical Examiner.*

Previous editions, under the editorial supervision of Prof R. M. Huston, have been received with marked favor, and they deserved it; but this, reprinted from a very late Dublin edition, carefully revised and brought up by the author to the present time, does present an unusually accurate and able exposition of every important particular embraced in the department of midwifery. * * The clearness, directness, and precision of its teachings, together with the great amount of statistical research which its text exhibits, have served to place it already in the foremost rank of works in this department of remedial science.—*N. O. Med. and Surg. Journal.*

In our opinion, it forms one of the best if not the very best text-book and epitome of obstetric science which we at present possess in the English language.—*Monthly Journal of Medical Science.*

The clearness and precision of style in which it is written, and the great amount of statistical research which it contains, have served to place it in the first rank of works in this department of medical science.—*N. Y. Journal of Medicine.*

Few treatises will be found better adapted as a text-book for the student, or as a manual for the frequent consultation of the young practitioner.—*American Medical Journal.*

BY THE SAME AUTHOR. (*Now Ready*, 1856.)

ON THE DISEASES OF INFANTS AND CHILDREN. Second American Edition, revised and enlarged by the author. Edited, with Notes, by W. V. Keating, M. D. In one large and handsome volume, extra cloth, of over 700 pages. $3 00, or in leather, $3 25.

In preparing this work a second time for the American profession, the author has spared no labor in giving it a very thorough revision, introducing several new chapters, and rewriting others, while every portion of the volume has been subjected to a severe scrutiny. The efforts of the American editor have been directed to supplying such information relative to matters peculiar to this country as might have escaped the attention of the author, and the whole may, therefore, be safely pronounced one of the most complete works on the subject accessible to the American Profession. By an alteration in the size of the page, these very extensive additions have been accommodated without unduly increasing the size of the work.

A few notices of the former edition are subjoined:—

We regard this volume as possessing more claims to completeness than any other of the kind with which we are acquainted. Most cordially and earnestly, therefore, do we commend it to our professional brethren, and we feel assured that the stamp of their approbation will in due time be impressed upon it. After an attentive perusal of its contents, we hesitate not to say, that it is one of the most comprehensive ever written upon the diseases of children, and that, for copiousness of reference, extent of research, and perspicuity of detail, it is scarcely to be equalled, and not to be excelled, in any language.—*Dublin Quarterly Journal.*

After this meagre, and we know, very imperfect notice of Dr. Churchill's work, we shall conclude by saying, that it is one that cannot fail from its copiousness, extensive research, and general accuracy, to exalt still higher the reputation of the author in this country. The American reader will be particularly pleased to find that Dr. Churchill has done full justice throughout his work to the various American authors on this subject. The names of Dewees, Eberle, Condie, and Stewart, occur on nearly every page, and these authors are constantly referred to by the author in terms of the highest praise, and with the most liberal courtesy.—*The Medical Examiner.*

The present volume will sustain the reputation acquired by the author from his previous works. The reader will find in it full and judicious directions for the management of infants at birth, and a compendious, but clear account of the diseases to which children are liable, and the most successful mode of treating them. We must not close this notice without calling attention to the author's style, which is perspicuous and polished to a degree, we regret to say, not generally characteristic of medical works. We recommend the work of Dr. Churchill most cordially, both to students and practitioners, as a valuable and reliable guide in the treatment of the diseases of children.—*Am. Journ. of the Med. Sciences.*

We know of no work on this department of Practical Medicine which presents so candid and unprejudiced a statement or posting up of our actual knowledge as this.—*N. Y. Journal of Medicine.*

Its claims to merit both as a scientific and practical work, are of the highest order. Whilst we would not elevate it above every other treatise on the same subject, we certainly believe that very few are equal to it, and none superior.—*Southern Med. and Surgical Journal.*

BY THE SAME AUTHOR.

ESSAYS ON THE PUERPERAL FEVER, AND OTHER DISEASES PECULIAR TO WOMEN. Selected from the writings of British Authors previous to the close of the Eighteenth Century. In one neat octavo volume, extra cloth, of about 450 pages. $2 50.

CHURCHILL (FLEETWOOD), M. D., M. R. I. A., &c.

ON THE DISEASES OF WOMEN; including those of Pregnancy and Childbed.

A new American edition, revised by the Author. With Notes and Additions, by D Francis Condie, M. D., author of "A Practical Treatise on the Diseases of Children." With numerous illustrations. In one large and handsome octavo volume, leather, of 768 pages. (*Now Ready*, May, 1857.) $3 00.

This edition of Dr. Churchill's very popular treatise may almost be termed a new work, so thoroughly has he revised it in every portion. It will be found greatly enlarged, and thoroughly brought up to the most recent condition of the subject, while the very handsome series of illustrations introduced, representing such pathological conditions as can be accurately portrayed, present a novel feature, and afford valuable assistance to the young practitioner. Such additions as appeared desirable for the American student have been made by the editor, Dr. Condie, while a marked improvement in the mechanical execution keeps pace with the advance in all other respects which the volume has undergone, while the price has been kept at the former very moderate rate. A few notices of the former edition are subjoined:—

We now regretfully take leave of Dr. Churchill's book. Had our typographical limits permitted, we should gladly have borrowed more from its richly stored pages. In conclusion, we heartily recommend it to the profession, and would at the same time express our firm conviction that it will not only add to the reputation of its author, but will prove a work of great and extensive utility to obstetric practitioners.—*Dublin Medical Press.*

Former editions of this work have been noticed in previous numbers of the Journal. The sentiments of high commendation expressed in those notices, have only to be repeated in this; not from the fact that the profession at large are not aware of the high merits which this work really possesses, but from a desire to see the principles and doctrines therein contained more generally recognized, and more universally carried out in practice.—*N. Y. Journal of Medicine.*

We know of no author who deserves that approbation, on "the diseases of females," to the same extent that Dr. Churchill does. His, indeed, is the only thorough treatise we know of on the subject; and it may be commended to practitioners and students as a masterpiece in its particular department. The former editions of this work have been commended strongly in this journal, and they have won their way to an extended, and a well-deserved popularity. This fifth edition, before us, is well calculated to maintain Dr. Churchill's high reputation. It was revised and enlarged by the author, for his American publishers, and it seems to us that there is scarcely any species of desirable information on its subjects that may not be found in this work.—*The Western Journal of Medicine and Surgery.*

We are gratified to announce a new and revised edition of Dr. Churchill's valuable work on the diseases of females We have ever regarded it as one of the very best works on the subjects embraced within its scope, in the English language; and the present edition, enlarged and revised by the author, renders it still more entitled to the confidence of the profession. The valuable notes of Prof. Huston have been retained, and contribute, in no small degree, to enhance the value of the work. It is a source of congratulation that the publishers have permitted the author to be, in this instance, his own editor, thus securing all the revision which an author alone is capable of making.—*The Western Lancet.*

As a comprehensive manual for students, or a work of reference for practitioners, we only speak with common justice when we say that it surpasses any other that has ever issued on the same subject from the British press.—*The Dublin Quarterly Journal.*

DICKSON (S. H.), M. D.,

Professor of Institutes and Practice of Medicine in the Medical College of South Carolina.

ELEMENTS OF MEDICINE; a Compendious View of Pathology and Therapeutics, or the History and Treatment of Diseases.

In one large and handsome octavo volume, of 750 pages, leather (*Lately Issued.*) $3 75.

As an American text-book on the Practice of Medicine for the student, and as a condensed work of reference for the practitioner, this volume will have strong claims on the attention of the profession. Few physicians have had wider opportunities than the author for observation and experience, and few perhaps have used them better. As the result of a life of study and practice, therefore, the present volume will doubtless be received with the welcome it deserves.

This book is eminently what it professes to be; a distinguished merit in these days. Designed for "Teachers and Students of Medicine," and admirably suited to their wants, we think it will be received, on its own merits, with a hearty welcome.—*Boston Med. and Surg. Journal.*

Indited by one of the most accomplished writers of our country, as well as by one who has long held a high position among teachers and practitioners of medicine, this work is entitled to patronage and careful study. The learned author has endeavored to condense in this volume most of the practical matter contained in his former productions, so as to adapt it to the use of those who have not time to devote to more extensive works.—*Southern Med. and Surg. Journal.*

We can strongly recommend Dr. Dickson's work to our readers as one of interest and practical utility, well deserving of a place in their libraries as a book of reference; and we especially commend the first part as presenting an admirable outline of the principles of medicine.—*Dublin Quarterly Journal*, Feb. 1856

This volume, while as its title denotes it is a compendious view, is also a comprehensive system of practice, perspicuously and pleasantly written, and admirably suited to engage the interest, and instruct the reader.—*Peninsular Journal of Medicine*, Jan. 1856.

Prof. Dickson's work supplies, to a great extent, a desideratum long felt in American medicine.—*N. O. Med. and Surg. Journal.*

Estimating this work according to the purpose for which it is designed, we must think highly of its merits, and we have no hesitation in predicting for it a favorable reception by both students and teachers.

Not professing to be a complete and comprehensive treatise, it will not be found full in detail, nor filled with discussions of theories and opinions, but embracing all that is essential in theory and practice, it is admirably adapted to the wants of the American student. Avoiding all that is uncertain, it presents more clearly to the mind of the reader that which is established and verified by experience. The varied and extensive reading of the author is conspicuously apparent, and all the recent improvements and discoveries in therapeutics and pathology are chronicled in its pages.—*Charleston Med. Journal.*

In the first part of the work the subject of general pathology is presented in outline, giving a beautiful picture of its distinguishing features, and throughout the succeeding chapters we find that he has kept scrupulously within the bounds of sound reasoning and legitimate deduction. Upon the whole, we do not hesitate to pronounce it a superior work in its class, and that Dr. Dickson merits a place in the first rank of American writers.—*Western Lancet.*

DRUITT (ROBERT), M. R. C. S., &c.

THE PRINCIPLES AND PRACTICE OF MODERN SURGERY.

A new American, from the improved London edition. Edited by F. W. SARGENT, M. D., author of "Minor Surgery," &c. Illustrated with one hundred and ninety-three wood-engravings. In one very handsomely printed octavo volume, leather, of 576 large pages. $3 00.

Dr. Druitt's researches into the literature of his subject have been not only extensive, but well directed; the most discordant authors are fairly and impartially quoted, and, while due credit is given to each, their respective merits are weighed with an unprejudiced hand. The grain of wheat is preserved, and the chaff is unmercifully stripped off. The arrangement is simple and philosophical, and the style, though clear and interesting, is so precise, that the book contains more information condensed into a few words than any other surgical work with which we are acquainted.—*London Medical Times and Gazette.*

No work, in our opinion, equals it in presenting so much valuable surgical matter in so small a compass.—*St. Louis Med. and Surgical Journal.*

Druitt's Surgery is too well known to the American medical profession to require its announcement anywhere. Probably no work of the kind has ever been more cordially received and extensively circulated than this. The fact that it comprehends in a comparatively small compass, all the essential elements of theoretical and practical Surgery—that it is found to contain reliable and authentic information on the nature and treatment of nearly all surgical affections—is a sufficient reason for the liberal patronage it has obtained. The editor, Dr. F. W. Sargent, has contributed much to enhance the value of the work, by such American improvements as are calculated more perfectly to adapt it to our own views and practice in this country. It abounds everywhere with spirited and life-like illustrations, which to the young surgeon, especially, are of no minor consideration. Every medical man frequently needs just such a work as this, for immediate reference in moments of sudden emergency, when he has not time to consult more elaborate treatises.—*The Ohio Medical and Surgical Journal.*

The author has evidently ransacked every standard treatise of ancient and modern times, and all that is really practically useful at the bedside will be found in a form at once clear, distinct, and interesting.—*Edinburgh Monthly Medical Journal.*

Druitt's work, condensed, systematic, lucid, and practical as it is, beyond most works on Surgery accessible to the American student, has had much currency in this country, and under its present auspices promises to rise to yet higher favor.—*The Western Journal of Medicine and Surgery.*

The most accurate and ample resumé of the present state of Surgery that we are acquainted with.—*Dublin Medical Journal.*

A better book on the principles and practice of Surgery as now understood in England and America, has not been given to the profession.—*Boston Medical and Surgical Journal.*

An unsurpassable compendium, not only of Surgical, but of Medical Practice.—*London Medical Gazette.*

This work merits our warmest commendations, and we strongly recommend it to young surgeons as an admirable digest of the principles and practice of modern Surgery.—*Medical Gazette.*

It may be said with truth that the work of Mr. Druitt affords a complete, though brief and condensed view, of the entire field of modern surgery. We know of no work on the same subject having the appearance of a manual, which includes so many topics of interest to the surgeon; and the terse manner in which each has been treated evinces a most enviable quality of mind on the part of the author, who seems to have an innate power of searching out and grasping the leading facts and features of the most elaborate productions of the pen. It is a useful handbook for the practitioner, and we should deem a teacher of surgery unpardonable who did not recommend it to his pupils. In our own opinion, it is admirably adapted to the wants of the student.—*Provincial Medical and Surgical Journal.*

DUNGLISON, FORBES, TWEEDIE, AND CONOLLY.

THE CYCLOPÆDIA OF PRACTICAL MEDICINE: comprising Treatises on the Nature and Treatment of Diseases, Materia Medica, and Therapeutics, Diseases of Women and Children, Medical Jurisprudence, &c. &c.

In four large super-royal octavo volumes, of 3254 double-columned pages, strongly and handsomely bound, with raised bands. $12 00.

*** This work contains no less than four hundred and eighteen distinct treatises, contributed by sixty-eight distinguished physicians, rendering it a complete library of reference for the country practitioner.

The most complete work on Practical Medicine extant; or, at least, in our language.—*Buffalo Medical and Surgical Journal.*

For reference, it is above all price to every practitioner.—*Western Lancet.*

One of the most valuable medical publications of the day—as a work of reference it is invaluable.—*Western Journal of Medicine and Surgery.*

It has been to us, both as learner and teacher, a work for ready and frequent reference, one in which modern English medicine is exhibited in the most advantageous light.—*Medical Examiner.*

We rejoice that this work is to be placed within the reach of the profession in this country, it being unquestionably one of very great value to the practitioner. This estimate of it has not been formed from a hasty examination, but after an intimate acquaintance derived from frequent consultation of it during the past nine or ten years. The editors are practitioners of established reputation, and the list of contributors embraces many of the most eminent professors and teachers of London, Edinburgh, Dublin, and Glasgow. It is, indeed, the great merit of this work that the principal articles have been furnished by practitioners who have not only devoted especial attention to the diseases about which they have written, but have also enjoyed opportunities for an extensive practical acquaintance with them, and whose reputation carries the assurance of their competency justly to appreciate the opinions of others, while it stamps their own doctrines with high and just authority.—*American Medical Journ.*

DEWEES'S COMPREHENSIVE SYSTEM OF MIDWIFERY. Illustrated by occasional cases and many engravings. Twelfth edition, with the author's last improvements and corrections In one octavo volume, extra cloth, of 600 pages. $3 20.

DEWEES'S TREATISE ON THE PHYSICAL AND MEDICAL TREATMENT OF CHILDREN. Tenth edition. In one volume, octavo, extra cloth, 548 pages. $2 80.

DEWEES'S TREATISE ON THE DISEASES OF FEMALES. Tenth edition. In one volume, octavo, extra cloth, 532 pages, with plates. $3 00.

DANA ON ZOOPHYTES AND CORALS. In one volume, imperial quarto, extra cloth, with wood-cuts. $15 00. Also, AN ATLAS, in one volume, imperial folio, with sixty-one magnificent colored plates. Bound in half morocco. $30 00.

DE LA BECHE'S GEOLOGICAL OBSERVER. In one very large and handsome octavo volume, extra cloth, of 700 pages, with 300 wood-cuts. $4 00.

FRICK ON RENAL AFFECTIONS; their Diagnosis and Pathology. With illustrations. One volume, royal 12mo., extra cloth. 75 cents.

DUNGLISON (ROBLEY), M. D.,

Professor of Institutes of Medicine in the Jefferson Medical College, Philadelphia.

MEDICAL LEXICON; a Dictionary of Medical Science, containing a concise

Explanation of the various Subjects and Terms of Physiology, Pathology, Hygiene, Therapeutics, Pharmacology, Obstetrics, Medical Jurisprudence, &c. With the French and other Synonymes; Notices of Climate and of celebrated Mineral Waters; Formulæ for various Officinal, Empirical, and Dietetic Preparations, etc. A NEW EDITION, revised, is now ready. In one very thick octavo volume, of over nine hundred large double-columned pages, strongly bound in leather, with raised bands. $4 00.

Every successive edition of this work bears the marks of the industry of the author, and of his determination to keep it fully on a level with the most advanced state of medical science. Thus nearly FIFTEEN THOUSAND WORDS have been added to it within the last few years. As a complete Medical Dictionary, therefore, embracing over FIFTY THOUSAND DEFINITIONS, in all the branches of the science, it is presented as meriting a continuance of the great favor and popularity which have carried it, within no very long space of time, through so many editions.

Every precaution has been taken in the preparation of the present volume, to render its mechanical execution and typographical accuracy worthy of its extended reputation and universal use. The very extensive additions have been accommodated, without materially increasing the bulk of the volume, by the employment of a small but exceedingly clear type, cast for this purpose. The press has been watched with great care, and every effort used to insure the verbal accuracy so necessary to a work of this nature. The whole is printed on fine white paper; and, while thus exhibiting in every respect so great an improvement over former issues, it is presented at the original exceedingly low price.

We welcome it cordially; it is an admirable work, and indispensable to all literary medical men. The labor which has been bestowed upon it is something prodigious. The work, however, has now been done, and we are happy in the thought that no human being will have again to undertake the same gigantic task. Revised and corrected from time to time, Dr. Dunglison's "Medical Lexicon" will last for centuries.—*British and Foreign Med.-Chirurg. Review.*

The fact that this excellent and learned work has passed through eight editions, and that a ninth is rendered necessary by the demands of the public, affords a sufficient evidence of the general appreciation of Dr. Dunglison's labors by the medical profession in England and America. It is a book which will be of great service to the student, in teaching him the meaning of all the technical terms used in medicine, and will be of no less use to the practitioner who desires to keep himself on a level with the advance of medical science.—*London Medical Times and Gazette.*

In taking leave of our author, we feel compelled to confess that his work bears evidence of almost incredible labor having been bestowed upon its composition.—*Edinburgh Journal of Med. Science.*

A miracle of labor and industry in one who has written able and voluminous works on nearly every branch of medical science. There could be no more useful book to the student or practitioner, in the present advancing age, than one in which would be found, in addition to the ordinary meaning and derivation of medical terms—so many of which are of modern introduction—concise descriptions of their explanation and employment; and all this and much more is contained in the volume before us. It is therefore almost as indispensable to the other learned professions as to our own. In fact, to all who may have occasion to ascertain the meaning of any word belonging to the many branches of medicine. From a careful examination of the present edition, we can vouch for its accuracy, and for its being brought quite up to the date of publication; the author states in his preface that he has added to it about four thousand terms, which are not to be found in the preceding one.—*Dublin Quarterly Journal of Medical Sciences.*

On the appearance of the last edition of this valuable work, we directed the attention of our readers to its peculiar merits; and we need do little more than state, in reference to the present reissue, that, notwithstanding the large additions previously made to it, no fewer than four thousand terms, not to be found in the preceding edition, are contained in the volume before us.—Whilst it is a wonderful monument of its author's erudition and industry, it is also a work of great practical utility, as we can testify from our own experience; for we keep it constantly within our reach, and make very frequent reference to it, nearly always finding in it the information we seek. —*British and Foreign Med.-Chirurg. Review.*

It has the rare merit that it certainly has no rival in the English language for accuracy and extent of references. The terms generally include short physiological and pathological descriptions, so that, as the author justly observes, the reader does not possess in this work a mere dictionary, but a book, which, while it instructs him in medical etymology, furnishes him with a large amount of useful information. The author's labors have been properly appreciated by his own countrymen; and we can only confirm their judgment, by recommending this most useful volume to the notice of our cisatlantic readers. No medical library will be complete without it.—*London Med. Gazette.*

It is certainly more complete and comprehensive than any with which we are acquainted in the English language. Few, in fact, could be found better qualified than Dr. Dunglison for the production of such a work. Learned, industrious, persevering, and accurate, he brings to the task all the peculiar talents necessary for its successful performance; while, at the same time, his familiarity with the writings of the ancient and modern "masters of our art," renders him skilful to note the exact usage of the several terms of science, and the various modifications which medical terminology has undergone with the change of theories or the progress of improvement.—*American Journal of the Medical Sciences.*

One of the most complete and copious known to the cultivators of medical science.—*Boston Med. Journal.*

The most comprehensive and best English Dictionary of medical terms extant.—*Buffalo Medical Journal.*

BY THE SAME AUTHOR.

THE PRACTICE OF MEDICINE. A Treatise on Special Pathology and Therapeutics.

Third Edition. In two large octavo volumes, leather, of 1,500 pages. $6 25.

Upon every topic embraced in the work the latest information will be found carefully posted up.—*Medical Examiner.*

The student of medicine will find, in these two elegant volumes, a mine of facts, a gathering of precepts and advice from the world of experience, that will nerve him with courage, and faithfully direct him in his efforts to relieve the physical sufferings of the race.—*Boston Medical and Surgical Journal.*

It is certainly the most complete treatise of which we have any knowledge.—*Western Journal of Medicine and Surgery.*

One of the mos telaborate treatises of the kind we have.—*Southern Med. and Surg. Journal.*

DUNGLISON (ROBLEY), M. D.,

Professor of Institutes of Medicine in the Jefferson Medical College, Philadelphia.

HUMAN PHYSIOLOGY. Eighth edition.

Thoroughly revised and extensively modified and enlarged, with five hundred and thirty-two illustrations. In two large and handsomely printed octavo volumes, leather, of about 1500 pages. (*Just Issued*, 1856.) $7 00.

In revising this work for its eighth appearance, the author has spared no labor to render it worthy a continuance of the very great favor which has been extended to it by the profession. The whole contents have been rearranged, and to a great extent remodelled; the investigations which of late years have been so numerous and so important, have been carefully examined and incorporated, and the work in every respect has been brought up to a level with the present state of the subject. The object of the author has been to render it a concise but comprehensive treatise, containing the whole body of physiological science, to which the student and man of science can at all times refer with the certainty of finding whatever they are in search of, fully presented in all its aspects; and on no former edition has the author bestowed more labor to secure this result.

A similar improvement will be found in the typographical execution of the volumes, which, in this respect, are superior to their predecessors. A large number of additional wood-cuts have been introduced, and the series of illustrations has been greatly modified by the substitution of many new ones for such as were not deemed satisfactory. By an enlargement of the page, these very considerable additions have been accommodated without increasing the size of the volumes to an extent to render them unwieldy.

We believe that it can truly be said, no more complete repertory of facts upon the subject treated, can anywhere be found. The author has, moreover, that enviable tact at description and that facility and ease of expression which render him peculiarly acceptable to the casual, or the studious reader. This faculty, so requisite in setting forth many graver and less attractive subjects, lends additional charms to one always fascinating.—*Boston Med. and Surg. Journal*, Sept. 1856.

The most complete and satisfactory system of Physiology in the English language.—*Amer. Med. Journal.*

The best work of the kind in the English language.—*Silliman's Journal.*

The present edition the author has made a perfect mirror of the science as it is at the present hour. As a work upon physiology proper, the science of the functions performed by the body, the student will find it all he wishes.—*Nashville Journ. of Med.* Sept. 1856.

That he has succeeded, most admirably succeeded in his purpose, is apparent from the appearance of an eighth edition. It is now the great encyclopædia on the subject, and worthy of a place in every physician's library.—*Western Lancet*, Sept. 1856.

BY THE SAME AUTHOR.

GENERAL THERAPEUTICS AND MATERIA MEDICA; adapted for a Medical Text-book.

New edition, much improved. With one hundred and eighty-seven illustrations. In two large and handsomely printed octavo vols., leather, of about 1100 pages. $6 00.

In this work of Dr. Dunglison, we recognize the same untiring industry in the collection and embodying of facts on the several subjects of which he treats, that has heretofore distinguished him, and we cheerfully point to these volumes, as two of the most interesting that we know of. In noticing the additions to this, the fourth edition, there is very little in the periodical or annual literature of the profession, published in the interval which has elapsed since the issue of the first, that has escaped the careful search of the author. As a book for reference, it is invaluable.—*Charleston Med. Journal and Review.*

It may be said to be *the* work now upon the subjects upon which it treats.—*Western Lancet.*

As a text-book for students, for whom it is particularly designed, we know of none superior to it.—*St. Louis Medical and Surgical Journal.*

It purports to be a new edition, but it is rather a new book, so greatly has it been improved, both in the amount and quality of the matter which it contains.—*N. O. Medical and Surgical Journal.*

We bespeak for this edition, from the profession, an increase of patronage over any of its former ones, on account of its increased merit.—*N. Y. Journal of Medicine.*

We consider this work unequalled.—*Boston Med. and Surg. Journal.*

BY THE SAME AUTHOR. (*A new Edition.*)

NEW REMEDIES, WITH FORMULÆ FOR THEIR PREPARATION AND ADMINISTRATION.

Seventh edition, with extensive Additions. In one very large octavo volume, leather, of 770 pages. (*Just Issued*, May, 1856.) $3 75.

Another edition of the "New Remedies" having been called for, the author has endeavored to add everything of moment that has appeared since the publication of the last edition.

The chief remedial means which have obtained a place, for the first time, in this volume, either owing to their having been recently introduced into pharmacology, or to their having received novel applications—and which, consequently, belong to the category of "New Remedies"—are the following:—

Apiol, Caffein, Carbazotic acid, Cauterization and catheterism of the larynx and trachea, Cedron, Cerium, Chloride of bromine, Chloride of iron, Chloride of sodium, Cinchonicine, Cod-liver olein, Congelation, Eau de Pagliari, Galvanic cautery, Hydriodic ether, Hyposulphite of soda and silver, Inunction, Iodide of sodium, Nickel, Permanganate of potassa, Phosphate of lime, Pumpkin, Quinidia, Rennet, Saccharine carbonate of iron and manganese, Santonin, Tellurium, and Traumaticine.

The articles treated of in the former editions will be found to have undergone considerable expansion in this, in order that the author might be enabled to introduce, as far as practicable, the results of the subsequent experience of others, as well as of his own observation and reflection; and to make the work still more deserving of the extended circulation with which the preceding editions have been favored by the profession. By an enlargement of the page, the numerous additions have been incorporated without greatly increasing the bulk of the volume.—*Preface.*

One of the most useful of the author's works.—*Southern Medical and Surgical Journal.*

This elaborate and useful volume should be found in every medical library, for as a book of reference, for physicians, it is unsurpassed by any other work in existence, and the double index for diseases and for remedies, will be found greatly to enhance its value.—*New York Med. Gazette.*

The great learning of the author, and his remarkable industry in pushing his researches into every source whence information is derivable, have enabled him to throw together an extensive mass of facts and statements, accompanied by full reference to authorities; which last feature renders the work practically valuable to investigators who desire to examine the original papers.—*The American Journal of Pharmacy.*

ERICHSEN (JOHN),

Professor of Surgery in University College, London, &c.

THE SCIENCE AND ART OF SURGERY; BEING A TREATISE ON SURGICAL INJURIES, DISEASES, AND OPERATIONS.

Edited by JOHN H. BRINTON, M. D. Illustrated with three hundred and eleven engravings on wood. In one large and handsome octavo volume, of over nine hundred closely printed pages, leather, raised bands. $4 25.

It is, in our humble judgment, decidedly the best book of the kind in the English language. Strange that just such books are not oftener produced by public teachers of surgery in this country and Great Britain. Indeed, it is a matter of great astonishment, but no less true than astonishing, that of the many works on surgery republished in this country within the last fifteen or twenty years as text-books for medical students, this is the only one that even approximates to the fulfilment of the peculiar wants of young men just entering upon the study of this branch of the profession.—*Western Jour. of Med. and Surgery.*

Its value is greatly enhanced by a very copious well-arranged index. We regard this as one of the most valuable contributions to modern surgery. To one entering his novitiate of practice, we regard it the most serviceable guide which he can consult. He will find a fulness of detail leading him through every step of the operation, and not deserting him until the final issue of the case is decided. For the same reason we recommend it to those whose routine of practice lies in such parts of the country that they must rarely encounter cases requiring surgical management.—*Stethoscope.*

Embracing, as will be perceived, the whole surgical domain, and each division of itself almost complete and perfect, each chapter full and explicit, each subject faithfully exhibited, we can only express our estimate of it in the aggregate. We consider it an excellent contribution to surgery, as probably the best single volume now extant on the subject, and with great pleasure we add it to our text-books.—*Nashville Journal of Medicine and Surgery.*

Prof. Erichsen's work, for its size, has not been surpassed; his nine hundred and eight pages, profusely illustrated, are rich in physiological, pathological, and operative suggestions, doctrines, details, and processes; and will prove a reliable resource for information, both to physician and surgeon, in the hour of peril.—*N. O. Med. and Surg. Journal.*

We are acquainted with no other work wherein so much good sense, sound principle, and practical inferences, stamp every page.—*American Lancet.*

ELLIS (BENJAMIN), M. D.

THE MEDICAL FORMULARY: being a Collection of Prescriptions, derived

from the writings and practice of many of the most eminent physicians of America and Europe. Together with the usual Dietetic Preparations and Antidotes for Poisons. To which is added an Appendix, on the Endermic use of Medicines, and on the use of Ether and Chloroform. The whole accompanied with a few brief Pharmaceutic and Medical Observations. Tenth edition, revised and much extended by ROBERT P. THOMAS, M. D., Professor of Materia Medica in the Philadelphia College of Pharmacy. In one neat octavo volume, extra cloth, of 296 pages. (*Lately Issued.*) $1 75.

After an examination of the new matter and the alterations, we believe the reputation of the work built up by the author, and the late distinguished editor, will continue to flourish under the auspices of the present editor, who has the industry and accuracy, and, we would say, conscientiousness requisite for the responsible task.—*Am. Jour. of Pharm.*

It will prove particularly useful to students and young practitioners, as the most important prescriptions employed in modern practice, which lie scattered through our medical literature, are here collected and conveniently arranged for reference.—*Charleston Med. Journal and Review.*

FOWNES (GEORGE), PH. D., &c.

ELEMENTARY CHEMISTRY; Theoretical and Practical.

With numerous illustrations. Edited, with Additions, by ROBERT BRIDGES, M. D. In one large royal 12mo. volume, of over 550 pages, with 181 wood-cuts. In leather, $1 50; extra cloth, $1 35.

We know of no better text-book, especially in the difficult department of organic chemistry, upon which it is particularly full and satisfactory. We would recommend it to preceptors as a capital "office book" for their students who are beginners in Chemistry. It is copiously illustrated with excellent wood-cuts, and altogether admirably "got up."—*N. J. Medical Reporter.*

A standard manual, which has long enjoyed the reputation of embodying much knowledge in a small space. The author has achieved the difficult task of condensation with masterly tact. His book is concise without being dry, and brief without being too dogmatical or general.—*Virginia Med. and Surgical Journal.*

The work of Dr. Fownes has long been before the public, and its merits have been fully appreciated as the best text-book on chemistry now in existence. We do not, of course, place it in a rank superior to the works of Brande, Graham, Turner, Gregory, or Gmelin, but we say that, as a work for students, it is preferable to any of them.—*London Journal of Medicine.*

A work well adapted to the wants of the student. It is an excellent exposition of the chief doctrines and facts of modern chemistry. The size of the work, and still more the condensed yet perspicuous style in which it is written, absolve it from the charges very properly urged against most manuals termed popular.—*Edinburgh Journal of Medical Science.*

FERGUSSON (WILLIAM), F. R. S.,

Professor of Surgery in King's College, London, &c.

A SYSTEM OF PRACTICAL SURGERY.

Fourth American, from the third and enlarged London edition. In one large and beautifully printed octavo volume, of about 700 pages, with 393 handsome illustrations, leather. $3 00.

The most important subjects in connection with practical surgery which have been more recently brought under the notice of, and discussed by, the surgeons of Great Britain, are fully and dispassionately considered by Mr. Fergusson, and that which was before wanting has now been supplied, so that we can now look upon it as a work on practical surgery instead of one on operative surgery alone. *Medical Times and Gazette.*

No work was ever written which more nearly comprehended the necessities of the student and practitioner, and was more carefully arranged to that single purpose than this.—*N. Y. Med. Journal.*

The addition of many new pages makes this work more than ever indispensable to the student and practitioner.—*Ranking's Abstract.*

Among the numerous works upon surgery published of late years, we know of none we value more highly than the one before us. It is perhaps the very best we have for a text-book and for ordinary reference, being concise and eminently practical.—*Southern Med. and Surg. Journal.*

FLINT (AUSTIN), M. D.,

Professor of the Theory and Practice of Medicine in the University of Louisville, &c.

(An Important New Work.)

PHYSICAL EXPLORATION AND DIAGNOSIS OF DISEASES AFFECTING THE RESPIRATORY ORGANS.

In one large and handsome octavo volume, extra cloth, 636 pages. *(Now Ready.)* $3 00.

We can only state our general impression of the high value of this work, and cordially recommend it to all. We regard it, in point both of arrangement and of the marked ability of its treatment of the subjects, as destined to take the first rank in works of this class. So far as our information extends, it has at present no equal. To the practitioner, as well as the student, it will be invaluable in clearing up the diagnosis of doubtful cases, and in shedding light upon difficult phenomena.—*Buffalo Med. Journal.*

This is the most elaborate work devoted exclusively to the physical exploration of diseases of the lungs, with which we are acquainted in the English language. From the high standing of the author as a clinical teacher, and his known devotion, during many years, to the study of thoracic diseases, much was to be expected from the announcement of his determination to embody in the form of a treatise, the results of his study and experience. These expectations we are confident will not be disappointed. For our own part, we have been favorably impressed by a perusal of the book, and heartily recommend it to all who are desirous of acquiring a thorough acquaintance with the means of exploring the conditions of the respiratory organs by means of auscultation and percussion.—*Boston Med. and Surg. Journal.*

A work of original observation of the highest merit. We recommend the treatise to every one who wishes to become a correct auscultator. Based to a very large extent upon cases numerically examined, it carries the evidence of careful study and discrimination upon every page. It does credit to the author, and, through him, to the profession in this country. It is, what we cannot call every book upon auscultation, a readable book.—*Am. Jour. Med. Sciences.*

FISKE FUND PRIZE ESSAYS.

THE EFFECTS OF CLIMATE ON TUBERCULOUS DISEASE.

By Edwin Lee, M. R. C. S., London.

THE INFLUENCE OF PREGNANCY ON THE DEVELOPMENT OF TUBERCLES.

By Edward Warren, M. D., of Edenton, N. C.

Together in one neat octavo volume, extra cloth. $1 00. *(Just Ready.)*

These two valuable Essays on Tuberculosis are reprinted by request of the Rhode Island Medical Society, from the "*American Journal of the Medical Sciences*" for April and July, 1857.

GRAHAM (THOMAS), F. R. S.,

Professor of Chemistry in University College, London, &c.

THE ELEMENTS OF CHEMISTRY.

Including the application of the Science to the Arts. With numerous illustrations. With Notes and Additions, by Robert Bridges, M. D., &c. &c. Second American, from the second and enlarged London edition.

PART I. *(Lately Issued)* large 8vo., 430 pages, 185 illustrations. $1 50.
PART II. *(Preparing)* to match.

GRIFFITH (ROBERT E.), M. D., &c.

A UNIVERSAL FORMULARY,

containing the methods of Preparing and Administering Officinal and other Medicines. The whole adapted to Physicians and Pharmaceutists. Second Edition, thoroughly revised, with numerous additions, by Robert P. Thomas, M. D., Professor of Materia Medica in the Philadelphia College of Pharmacy. In one large and handsome octavo volume, extra cloth, of 650 pages, double columns. *(Just Issued.)* $3 00; or bound in sheep, $3 25.

It was a work requiring much perseverance, and when published was looked upon as by far the best work of its kind that had issued from the American press. Prof Thomas has certainly "improved," as well as added to this Formulary, and has rendered it additionally deserving of the confidence of pharmaceutists and physicians.—*Am. Journal of Pharmacy.*

We are happy to announce a new and improved edition of this, one of the most valuable and useful works that have emanated from an American pen. It would do credit to any country, and will be found of daily usefulness to practitioners of medicine; it is better adapted to their purposes than the dispensatories.—*Southern Med. and Surg. Journal.*

A new edition of this well-known work, edited by R. P. Thomas, M. D., affords occasion for renewing our commendation of so useful a handbook, which ought to be universally studied by medical men of every class, and made use of by way of reference by office pupils, as a standard authority. It has been much enlarged, and now condenses a vast amount of needful and necessary knowledge in small compass. The more of such books the better for the profession and the public.—*N. Y. Med. Gazette.*

It is one of the most useful books a country practitioner can possibly have in his possession.—*Medical Chronicle.*

The amount of useful, every-day matter, for a practicing physician, is really immense.—*Boston Med. and Surg. Journal.*

This is a work of six hundred and fifty-one pages, embracing all on the subject of preparing and administering medicines that can be desired by the physician and pharmaceutist.—*Western Lancet.*

In short, it is a full and complete work of the kind, and should be in the hands of every physician and apothecary. *O. Med. and Surg. Journal*

We predict a great sale for this work, and we especially recommend it to all *medical* teachers.—*Richmond Stethoscope.*

This edition of Dr. Griffith's work has been greatly improved by the revision and ample additions of Dr. Thomas, and is now, we believe, one of the most complete works of its kind in any language. The additions amount to about seventy pages, and no effort has been spared to include in them all the recent improvements which have been published in medical journals, and systematic treatises. A work of this kind appears to us indispensable to the physician, and there is none we can more cordially recommend.—*N. Y. Journal of Medicine.*

BY THE SAME AUTHOR.

MEDICAL BOTANY;

or, a Description of all the more important Plants used in Medicine, and of their Properties, Uses, and Modes of Administration. In one large octavo volume, extra cloth, of 704 pages, handsomely printed, with nearly 350 illustrations on wood. $3 00.

GROSS (SAMUEL D.), M. D.,

Professor of Surgery in the Jefferson Medical College of Philadelphia, &c.

New Edition (Now Ready.)

ELEMENTS OF PATHOLOGICAL ANATOMY. Third edition, thoroughly revised and greatly improved. In one large and very handsome octavo volume, with about three hundred and fifty beautiful illustrations, of which a large number are from original drawings. Price in extra cloth, $4 75; leather, raised bands, $5 25.

The length of time which has elapsed since the appearance of the last edition of this work, and the energetic labors of the numerous investigators of pathological subjects, have so changed the details of the science, that very extensive alterations have been found requisite in its revision, to bring it thoroughly up to the present state of the subject. In many respects this edition may therefore be regarded as a new work. A similar improvement will likewise be found in its mechanical execution, and in the series of illustrations, which has been greatly altered and improved. In every respect it may therefore be expected to fully maintain the very high reputation which it has acquired as a sound practical text-book on all points relating to its important subject, while a considerable reduction has been made in the price.

BY THE SAME AUTHOR.

A PRACTICAL TREATISE ON THE DISEASES, INJURIES, AND MALFORMATIONS OF THE URINARY BLADDER, THE PROSTATE GLAND, AND THE URETHRA. Second Edition, revised and much enlarged, with one hundred and eighty-four illustrations. In one large and very handsome octavo volume, of over nine hundred pages. (*Just Issued.*) In leather, raised bands, $5 25; extra cloth, $4 75.

A volume replete with truths and principles of the utmost value in the investigation of these diseases.—*American Medical Journal.*

On the appearance of the first edition of this work, the leading English medical review predicted that it would have a "permanent place in the literature of surgery worthy to rank with the best works of the present age." This prediction has been amply fulfilled. Dr. Gross's treatise has been found to supply completely the want which has been felt ever since the elevation of surgery to the rank of a science, of a good practical treatise on the diseases of the bladder and its accessory organs. Philosophical in its design, methodical in its arrangement, ample and sound in its practical details, it may in truth be said to leave scarcely anything to be desired on so important a subject, and with the additions and modifications resulting from future discoveries and improvements, it will probably remain one of the most valuable works on this subject so long as the science of medicine shall exist.—*Boston Med. and Surg. Journal.*

Dr. Gross has brought all his learning, experience, tact, and judgment to the task, and has produced a work worthy of his high reputation. We feel perfectly safe in recommending it to our readers as a monograph unequalled in interest and practical value by any other on the subject in our language.—*Western Journal of Med. and Surg.*

Whoever will peruse the vast amount of valuable practical information it contains, and which we have been unable even to notice, will, we think, agree with us, that there is no work in the English language which can make any just pretensions to be its equal.—*N. Y. Journal of Medicine.*

BY THE SAME AUTHOR. (*Just Issued*).

A PRACTICAL TREATISE ON FOREIGN BODIES IN THE AIR-PASSAGES. In one handsome octavo volume, extra cloth, with illustrations. pp. 468. $2 75.

A very elaborate work. It is a complete summary of the whole subject, and will be a useful book of reference.—*British and Foreign Medico-Chirurg. Review.*

A highly valuable book of reference on a most important subject in the practice of medicine. We conclude by recommending it to our readers, fully persuaded that its perusal will afford them much practical information well conveyed, evidently derived from considerable experience and deduced from an ample collection of facts.—*Dublin Quarterly Journal*, May, 1855.

BY THE SAME AUTHOR. (*Preparing.*)

A SYSTEM OF SURGERY; Diagnostic, Pathological, Therapeutic, and Operative. With very numerous engravings on wood.

GLUGE (GOTTLIEB), M. D.,

Professor of Physiology and Pathological Anatomy in the University of Brussels, &c.

AN ATLAS OF PATHOLOGICAL HISTOLOGY. Translated, with Notes and Additions, by JOSEPH LEIDY, M. D., Professor of Anatomy in the University of Pennsylvania. In one volume, very large imperial quarto, extra cloth, with 320 figures, plain and colored, on twelve copperplates. $5 00.

GARDNER'S MEDICAL CHEMISTRY, for the use of Students and the Profession. In one royal 12mo. vol., ex. cloth, pp. 396, with illustrations. $1 00.

HARRISON'S ESSAY TOWARDS A CORRECT THEORY OF THE NERVOUS SYSTEM. In one octavo volume, leather, 292 pages. $1 50.

HUGHES' CLINICAL INTRODUCTION TO THE PRACTICE OF AUSCULTATION AND OTHER MODES OF PHYSICAL DIAGNOSIS, IN DISEASES OF THE LUNGS AND HEART. Second American, from the second London edition. 1 vol. royal 12mo., ex. cloth, pp. 304. $1 00.

HAMILTON (FRANK H.), M. D.,

Professor of Surgery, in Buffalo Medical College, &c.

A TREATISE ON FRACTURES AND DISLOCATIONS. In one handsome octavo volume, with numerous illustrations. (*Preparing.*)

HOBLYN (RICHARD D.), M. D.

A DICTIONARY OF THE TERMS USED IN MEDICINE AND THE COLLATERAL SCIENCES.

By Richard D. Hoblyn, A. M., &c. A new American from the last London edition. Revised, with numerous Additions, by Isaac Hays, M. D., editor of the "American Journal of the Medical Sciences." In one large royal 12mo. volume, leather, of over 500 double columned pages. (*Just Issued*, 1856.) $1 50.

If the frequency with which we have referred to this volume since its reception from the publisher, two or three weeks ago, be any criterion for the future, the binding will soon have to be renewed, even with careful handling. We find that Dr. Hays has done the profession great service by his careful and industrious labors. The Dictionary has thus become eminently suited to our medical brethren in this country. The additions by Dr. Hays are in brackets, and we believe there is not a single page but bears these insignia; in every instance which we have thus far noticed, the additions are really needed and exceedingly valuable. We heartily commend the work to all who wish to be *au courant* in medical terminology.—*Boston Med. and Surg. Journal.*

To both practitioner and student, we recommend this dictionary as being convenient in size, accurate in definition, and sufficiently full and complete for ordinary consultation.—*Charleston Med. Journ. and Review.*

Admirably calculated to meet the wants of the practitioner or student, who has neither the means nor desire to procure a larger work.—*American Lancet.*

Hoblyn has always been a favorite dictionary, and in its present enlarged and improved form will give greater satisfaction than ever. The American editor, Dr. Hays, has made many very valuable additions. —*N. J. Med. Reporter.*

To supply the want of the medical reader arising from this cause, we know of no dictionary better arranged and adapted than the one bearing the above title. It is not encumbered with the obsolete terms of a bygone age, but it contains all that are now in use; embracing every department of medical science down to the very latest date. The volume is of a convenient size to be used by the medical student, and yet large enough to make a respectable appearance in the library of a physician.—*Western Lancet.*

Hoblyn's Dictionary has long been a favorite with us. It is the best book of definitions we have, and ought always to be upon the student's table.—*Southern Med. and Surg. Journal.*

HOLLAND (SIR HENRY), BART., M. D., F. R. S.,

Physician in Ordinary to the Queen of England, &c.

MEDICAL NOTES AND REFLECTIONS.

From the third London edition. In one handsome octavo volume, extra cloth. (*Now Ready.*) $3 00.

As the work of a thoughtful and observant physician, embodying the results of forty years' active professional experience, on topics of the highest interest, this volume is commended to the American practitioner as well worthy his attention. Few will rise from its perusal without feeling their convictions strengthened, and armed with new weapons for the daily struggle with disease.

HUNTER (JOHN).

TREATISE ON THE VENEREAL DISEASE.

With copious Additions, by Dr. Ph. Ricord, Surgeon to the Venereal Hospital of Paris. Edited, with additional Notes, by F. J. Bumstead, M. D. In one octavo volume, with plates. $3 25. ☞ See Ricord.

Also, HUNTER'S COMPLETE WORKS, with Memoir, Notes, &c. &c. In four neat octavo volumes, leather, with plates. $10 00.

HORNER (WILLIAM E.), M. D.,

Professor of Anatomy in the University of Pennsylvania.

SPECIAL ANATOMY AND HISTOLOGY.

Eighth edition. Extensively revised and modified. In two large octavo volumes, extra cloth, of more than one thousand pages, handsomely printed, with over three hundred illustrations. $6 00.

This edition enjoyed a thorough and laborious revision on the part of the author shortly before his death, with the view of bringing it fully up to the existing state of knowledge on the subject of general and special anatomy. To adapt it more perfectly to the wants of the student, he introduced a large number of additional wood-engravings, illustrative of the objects described, while the publishers have endeavored to render the mechanical execution of the work worthy of its extended reputation.

JONES (T. WHARTON), F. R. S.,

Professor of Ophthalmic Medicine and Surgery in University College, London, &c.

THE PRINCIPLES AND PRACTICE OF OPHTHALMIC MEDICINE AND SURGERY.

With one hundred and ten illustrations. Second American from the second and revised London edition, with additions by Edward Hartshorne, M. D., Surgeon to Wills' Hospital, &c. In one large, handsome royal 12mo. volume, extra cloth, of 500 pages. (*Now Ready.*) $1 50.

We are confident that the reader will find, on perusal, that the execution of the work amply fulfils the promise of the preface, and sustains, in every point, the already high reputation of the author as an ophthalmic surgeon as well as a physiologist and pathologist. The book is evidently the result of much labor and research, and has been written with the greatest care and attention; it possesses that best quality which a general work, like a system or manual can show, viz: the quality of having all the materials whencesoever derived, so thoroughly wrought up, and digested in the author's mind, as to come forth with the freshness and impressiveness of an original production. We entertain little doubt that this book will become what its author hoped it might become, a manual for daily reference and consultation by the student and the general practitioner. The work is marked by that correctness, clearness, and precision of style which distinguish all the productions of the learned author.—*British and For. Med. Review.*

JONES (C. HANDFIELD), F. R. S., & EDWARD H. SIEVEKING, M. D.,

Assistant Physicians and Lecturers in St. Mary's Hospital, London.

A MANUAL OF PATHOLOGICAL ANATOMY. First American Edition,

Revised. With three hundred and ninety-seven handsome wood engravings. In one large and beautiful octavo volume of nearly 750 pages, leather. (*Lately Issued.*) $3 75.

As a concise text-book, containing, in a condensed form, a complete outline of what is known in the domain of Pathological Anatomy, it is perhaps the best work in the English language. Its great merit consists in its completeness and brevity, and in this respect it supplies a great desideratum in our literature. Heretofore the student of pathology was obliged to glean from a great number of monographs, and the field was so extensive that but few cultivated it with any degree of success. As a simple work of reference, therefore, it is of great value to the student of pathological anatomy, and should be in every physician's library.—*Western Lancet.*

In offering the above titled work to the public, the authors have not attempted to intrude new views on their professional brethren, but simply to lay before them, what has long been wanted, an outline of the present condition of pathological anatomy. In this they have been completely successful. The work is one of the best compilations which we have ever perused.—*Charleston Medical Journal and Review.*

We urge upon our readers and the profession generally the importance of informing themselves in regard to modern views of pathology, and recommend to them to procure the work before us as the best means of obtaining this information.—*Stethoscope.*

From the casual examination we have given we are inclined to regard it as a text-book, plain, rational, and intelligible, such a book as the practical man needs for daily reference. For this reason it will be likely to be largely useful, as it suits itself to those busy men who have little time for minute investigation, and prefer a summary to an elaborate treatise.—*Buffalo Medical Journal.*

KIRKES (WILLIAM SENHOUSE), M. D.,

Demonstrator of Morbid Anatomy at St. Bartholomew's Hospital, &c.

A MANUAL OF PHYSIOLOGY. A new American, from the third and

improved London edition. With two hundred illustrations. In one large and handsome royal 12mo. volume, leather. pp. 586. $2 00. (*Now Ready*, 1857.)

In again passing this work through his hands, the author has endeavored to render it a correct exposition of the present condition of the science, making such alterations and additions as have been dictated by further experience, or as the progress of investigation has rendered desirable. In every point of mechanical execution the publishers have sought to make it superior to former editions, and at the very low price at which it is offered, it will be found one of the handsomest and cheapest volumes before the profession.

In making these improvements, care has been exercised not unduly to increase its size, thus maintaining its distinctive characteristic of presenting within a moderate compass a clear and connected view of its subjects, sufficient for the wants of the student.

This is a new and very much improved edition of Dr. Kirkes' well-known Handbook of Physiology. Originally constructed on the basis of the admirable treatise of Miller, it has in successive editions developed itself into an almost original work, though no change has been made in the plan or arrangement. It combines conciseness with completeness, and is, therefore, admirably adapted for consultation by the busy practitioner.—*Dublin Quarterly Journal*, Feb. 1857.

Its excellence is in its compactness, its clearness, and its carefully cited authorities. It is the most convenient of text-books. These gentlemen, Messrs Kirkes and Paget, have really an immense talent for silence, which is not so common or so cheap as prating people fancy. They have the gift of telling us what we want to know, without thinking it necessary to tell us all they know.—*Boston Med and Surg. Journal*, May 14, 1857.

One of the very best handbooks of Physiology we possess—presenting just such an outline of the science, comprising an account of its leading facts and generally admitted principles, as the student requires during his attendance upon a course of lectures, or for reference whilst preparing for examination.—*Am. Medical Journal.*

We need only say, that, without entering into discussions of unsettled questions, it contains all the recent improvements in this department of medical science. For the student beginning this study, and the practitioner who has but leisure to refresh his memory, this book is invaluable, as it contains all that it is important to know, without special details, which are read with interest only by those who would make a specialty, or desire to possess a critical knowledge of the subject.—*Charleston Medical Journal.*

KNAPP'S TECHNOLOGY; or, Chemistry applied to the Arts and to Manufactures. Edited, with numerous Notes and Additions, by Dr. EDMUND RONALDS and Dr. THOMAS RICHARDSON. First American edition, with Notes and Additions, by Prof. WALTER R. JOHNSON. In two handsome octavo volumes, extra cloth, with about 500 wood-engravings. $6 00.

LALLEMAND ON SPERMATORRHŒA. Translated and edited by HENRY J. McDOUGAL. In one volume, octavo, extra cloth, 320 pages. Second American edition. $1 75.

LUDLOW (J. L.), M. D.

A MANUAL OF EXAMINATIONS upon Anatomy, Physiology, Surgery,

Practice of Medicine, Obstetrics, Materia Medica, Chemistry, Pharmacy, and Therapeutics. To which is added a Medical Formulary. Designed for Students of Medicine throughout the United States. Third edition, thoroughly revised and greatly extended and enlarged. With three hundred and seventy illustrations. In one large and handsome royal 12mo. volume, leather, of over 800 closely printed pages (*Now Ready.*) $2 50.

The great popularity of this volume, and the numerous demands for it during the two years in which it has been out of print, have induced the author in its revision to spare no pains to render it a correct and accurate digest of the most recent condition of all the branches of medical science. In many respects it may, therefore, be regarded rather as a new book than a new edition, an entire section on Physiology having been added, as also one on Organic Chemistry, and many portions having been rewritten. A very complete series of illustrations has been introduced, and every care has been taken in the mechanical execution to render it a convenient and satisfactory book for study or reference.

The arrangement of the volume in the form of question and answer renders it especially suited for the office examination of students and for those preparing for graduation.

We know of no better companion for the student during the hours spent in the lecture room, or to refresh, at a glance, his memory of the various topics *crammed* into his head by the various professors to whom he is compelled listen.—*Western Lancet*, May, 1857.

LEHMANN (C. G.)

PHYSIOLOGICAL CHEMISTRY. Translated from the second edition by GEORGE E. DAY, M. D., F. R. S., &c., edited by R. E. ROGERS, M. D., Professor of Chemistry in the Medical Department of the University of Pennsylvania, with illustrations selected from Funke's Atlas of Physiological Chemistry, and an Appendix of plates. Complete in two large and handsome octavo volumes, extra cloth, containing 1200 pages, with nearly two hundred illustrations. (*Just Issued.*) $6 00.

This great work, universally acknowledged as the most complete and authoritative exposition of the principles and details of Zoochemistry, in its passage through the press, has received from Professor Rogers such care as was necessary to present it in a correct and reliable form. To such a work additions were deemed superfluous, but several years having elapsed between the appearance in Germany of the first and last volume, the latter contained a supplement, embodying numerous corrections and additions resulting from the advance of the science. These have all been incorporated in the text in their appropriate places, while the subjects have been still further elucidated by the insertion of illustrations from the Atlas of Dr. Otto Funke. With the view of supplying the student with the means of convenient comparison, a large number of wood-cuts, from works on kindred subjects, have also been added in the form of an Appendix of Plates. The work is, therefore, presented as in every way worthy the attention of all who desire to be familiar with the modern facts and doctrines of Physiological Science.

The most important contribution as yet made to Physiological Chemistry.—*Am. Journal Med. Sciences*, Jan. 1856.

The present volumes belong to the small class of medical literature which comprises elaborate works of the highest order of merit.—*Montreal Med. Chronicle*, Jan. 1856.

The work of Lehmann stands unrivalled as the most comprehensive book of reference and information extant on every branch of the subject on which it treats.—*Edinburgh Monthly Journal of Medical Science.*

Already well known and appreciated by the scientific world, Professor Lehmann's great work requires no laudatory sentences, as, under a new garb, it is now presented to us. The little space at our command would ill suffice to set forth even a small portion of its excellences.—*Boston Med. and Surg. Journal*, Dec. 1855.

BY THE SAME AUTHOR. (*Just Issued*, 1856.)

MANUAL OF CHEMICAL PHYSIOLOGY. Translated from the German, with Notes and Additions, by J. CHESTON MORRIS, M. D., with an Introductory Essay on Vital Force, by SAMUEL JACKSON, M. D., Professor of the Institutes of Medicine in the University of Pennsylvania. With illustrations on wood. In one very handsome octavo volume, extra cloth, of 336 pages. $2 25.

From Prof. Jackson's Introductory Essay.

In adopting the handbook of Dr. Lehmann as a manual of Organic Chemistry for the use of the students of the University, and in recommending his original work of PHYSIOLOGICAL CHEMISTRY for their more mature studies, the high value of his researches, and the great weight of his authority in that important department of medical science are fully recognized.

The present volume will be a very convenient one for students, as offering a brief epitome of the more elaborate work, and as containing, in a very condensed form, the positive facts of Physiological Chemistry.—*Am. Journal Med. Sciences*, April, 1856.

LAWRENCE (W.), F. R. S., &c.

A TREATISE ON DISEASES OF THE EYE. A new edition, edited, with numerous additions, and 243 illustrations, by ISAAC HAYS, M. D., Surgeon to Will's Hospital, &c. In one very large and handsome octavo volume, of 950 pages, strongly bound in leather with raised bands. $5 00.

This work is so universally recognized as the standard authority on the subject, that the publishers in presenting this new edition have only to remark that in its preparation the editor has carefully revised every portion, introducing additions and illustrations wherever the advance of science has rendered them necessary or desirable, constituting it a complete and thorough exponent of the most advanced state of the subject.

This admirable treatise—the safest guide and most comprehensive work of reference, which is within the reach of the profession.—*Stethoscope.*

This standard text-book on the department of which it treats, has not been superseded, by any or all of the numerous publications on the subject heretofore issued. Nor with the multiplied improvements of Dr. Hays, the American editor, is it at all likely that this great work will cease to merit the confidence and preference of students or practitioners. Its ample extent—nearly one thousand large octavo pages—has enabled both author and editor to do justice to all the details of this subject, and condense in this single volume the present state of our knowledge of the whole science in this department, whereby its practical value cannot be excelled. We heartily commend it, especially as a book of reference, indispensable in every medical library. The additions of the American editor very greatly enhance the value of the work, exhibiting the learning and experience of Dr. Hays, in the light in which he ought to be held, as a standard authority on all subjects appertaining to this specialty.—*N. Y. Med. Gaz.*

LARDNER (DIONYSIUS), D. C. L., &c.

HANDBOOKS OF NATURAL PHILOSOPHY AND ASTRONOMY. Revised, with numerous Additions, by the American editor. FIRST COURSE, containing Mechanics, Hydrostatics, Hydraulics, Pneumatics, Sound, and Optics. In one large royal 12mo. volume, of 750 pages, with 424 wood-cuts. $1 75. SECOND COURSE, containing Heat, Electricity, Magnetism, and Galvanism, one volume, large royal 12mo., of 450 pages, with 250 illustrations. $1 25. THIRD COURSE (*now ready*), containing Meteorology and Astronomy, in one large volume, royal 12mo. of nearly 800 pages, with 37 plates and 200 wood-cuts. $2 00.

LA ROCHE (R.), M. D., &c.

YELLOW FEVER, considered in its Historical, Pathological, Etiological, and Therapeutical Relations. Including a Sketch of the Disease as it has occurred in Philadelphia from 1699 to 1854, with an examination of the connections between it and the fevers known under the same name in other parts of temperate as well as in tropical regions. In two large and handsome octavo volumes of nearly 1500 pages, extra cloth. (*Just Issued.*) $7 00.

From Professor S. H. Dickson, Charleston, S. C., September 18, 1855.

A monument of intelligent and well applied research, almost without example. It is, indeed, in itself, a large library, and is destined to constitute the special resort as a book of reference, in the subject of which it treats, to all future time.

We have not time at present, engaged as we are, by day and by night, in the work of combating this very disease, now prevailing in our city, to do more than give this cursory notice of what we consider as undoubtedly the most able and erudite medical publication our country has yet produced But in view of the startling fact, that this, the most malignant and unmanageable disease of modern times, has for several years been prevailing in our country to a greater extent than ever before; that it is no longer confined to either large or small cities, but penetrates country villages, plantations, and farmhouses; that it is treated with scarcely better success now than thirty or forty years ago; that there is vast mischief done by ignorant pretenders to knowledge in regard to the disease, and in view of the probability that a majority of southern physicians will be called upon to treat the disease, we trust that this able and comprehensive treatise will be very generally read in the south.—*Memphis Med. Recorder.*

This is deeidedly *the* great American medical work of the day—a full, complete, and systematic treatise, unequalled by any other upon the all-important subject of Yellow Fever. The laborious, indefatigable, and learned author has devoted to it many years of arduous researeh and careful study, and the result is such as will reflect the highest honor upon the author and our country.—*Southern Med. and Surg. Journal.*

The genius and scholarship of this great physician could not have been better employed than in the erection of this towering monument to his own fame, and to the glory of the medical literature of his own country. It is destined to remain the great authority upon the subject of Yellow Fever. The student and physician will find in these volumes a *résumé* of the sum total of the knowledge of the world upon the awful scourge which they so elaborately discuss. The style is so soft and so pure as to refresh and invigorate the mind while absorbing the thoughts of the gifted author, while the publishers have suoeeeded in bringing the externals into a most felicitous harmony with the inspiration that dwells within. Take it all in all, it is a book we have often dreamed of, but dreamed not that it would ever meet our waking eye as a tangible reality.—*Nashville Journal of Medicine.*

We deem it fortunate that the splendid work of Dr. La Roche should have been issued from the press at this particular time. The want of a reliable digest of all that is known in relation to this frightful malady has long been felt—a want very satisfactorily met in the work before us. We deem it but faint praise to say that Dr. La Roche has succeeded in presenting the profession with an able and complete monograph, one which will find its way into every well ordered library.—*Va. Stethoscope.*

BY THE SAME AUTHOR.

PNEUMONIA; its Supposed Connection, Pathological and Etiological, with Autumnal Fevers, including an Inquiry into the Existence and Morbid Agency of Malaria. In one handsome octavo volume, extra cloth, of 500 pages. $3 00.

A more simple, clear, and forcible exposition of the groundless nature and dangerous tendency of certain pathologieal and etiological heresies, has seldom been presented to our notice.—*N. Y. Journal of Medicine and Collateral Science.*

This work should be carefully studied by Southern physicians, embodying as it does the reflections of an original thinker and close observer on a subject peculiarly their own.—*Virginia Med. and Surgical Journal.*

LAYCOCK (THOMAS), M. D., F. R. S. E.,

Professor of Practical and Clinical Medicine in the University of Edinburgh, &c.

LECTURES ON THE PRINCIPLES AND METHODS OF MEDICAL OBSERVATION AND RESEARCH. For the Use of Advanced Students and Junior Practitioners. In one very neat royal 12mo. volume, extra cloth. Price $1 00. (*Just Published*, 1857.)

A review of the book cannot now be attempted; and our desire is simply to recommend it to all—not merely the class for which it was designed; since there are many senior practitioners in full and (pecuniarily) successful practice who would be very much benefited by a close study of its precepts and principles.—*Va. Med. Journal*, March, 1857.

To the medical investigator, who would be philosophical, and who would accustom himself to observe and to think, the work before us will be scarcely less than a cyclopædia—a treasury of logical professional thought and reasoning. Appropriated to a heretofore unoccupied field of research, and designed to fill an obvious hiatus, in medical literature, it may in truth, from its discussiveness of reasoning, and its copiousness as regards number and variety of topics, with great propriety be denominated *multum in parvo.*—*Medical Independent*, Detroit, April, 1857.

This is a most interesting and suggestive little work.—*N. J. Med. Reporter*, March, 1857.

MULLER'S PRINCIPLES OF PHYSICS AND METEOROLOGY. Edited, with Additions, by R. Eglesfeld Griffith, M. D. In one large and handsome octavo volume, extra cloth, with 550 wood-cuts, and two colored plates. pp. 636. $3 50.

MILLER (HENRY), M. D.,

Professor of Obstetrics and Diseases of Women and Children in the University of Louisville.

PRINCIPLES AND PRACTICE OF OBSTETRICS, &c.; including the Treatment of Chronic Inflammation of the Cervix and Body of the Uterus considered as a frequent cause of Abortion. With illustrations on wood. In one very handsome octavo volume, of over 600 pages. (*In Press.*)

The very favorable reception accorded by the profession to the "Treatise on Human Parturition," published some years since by Prof. Miller, is an earnest that the present work will fulfil the author's purpose of providing within moderate compass an accurate and trustworthy text-book for the student, and work of reference for the Obstetric practitioner. Based upon the former work, but enlarged to more than double its size, and almost entirely rewritten, it presents the matured experience gained in long and extensive practice, while the author's position as a teacher for so many years has given him a familiarity with the wants of students, and a facility of conveying instruction, which cannot fail to render the volume eminently adapted to its purposes.

MEIGS (CHARLES D.), M. D.,

Professor of Obstetrics, &c. in the Jefferson Medical College, Philadelphia.

OBSTETRICS: THE SCIENCE AND THE ART. Third edition, revised and improved.

With one hundred and twenty-nine illustrations. In one beautifully printed octavo volume, leather, of seven hundred and fifty-two large pages. $3 75.

The rapid demand for another edition of this work is a sufficient expression of the favorable verdict of the profession. In thus preparing it a third time for the press, the author has endeavored to render it in every respect worthy of the favor which it has received. To accomplish this he has thoroughly revised it in every part. Some portions have been rewritten others added, new illustrations have been in many instances substituted for such as were not deemed satisfactory, while, by an alteration in the typographical arrangement, the size of the work has not been increased, and the price remains unaltered. In its present improved form, it is, therefore, hoped that the work will continue to meet the wants of the American profession as a sound, practical, and extended System of Midwifery.

Though the work has received only five pages of enlargement, its chapters throughout wear the impress of careful revision. Expunging and rewriting, remodelling its sentences, with occasional new material, all evince a lively desire that it shall deserve to be regarded as improved in *manner* as well as *matter*. In the *matter*, every stroke of the pen has increased the value of the book, both in expungings and additions —*Western Lancet*, Jan. 1857.

The best American work on Midwifery that is accessible to the student and practitioner—*N. W. Med. and Surg. Journal*, Jan. 1857.

This is a standard work by a great American Obstetrician. It is the third and last edition, and, in the language of the preface, the author has "brought the subject up to the latest dates of real improvement in our art and Science."—*Nashville Journ. of Med. and Surg.*, May, 1857.

BY THE SAME AUTHOR. (*Lately Issued.*)

WOMAN: HER DISEASES AND THEIR REMEDIES. A Series of Lectures to his Class. Third and Improved edition.

In one large and beautifully printed octavo volume, leather. pp. 672. $3 60.

The gratifying appreciation of his labors, as evinced by the exhaustion of two large impressions of this work within a few years, has not been lost upon the author, who has endeavored in every way to render it worthy of the favor with which it has been received. The opportunity thus afforded for a second revision has been improved, and the work is now presented as in every way superior to its predecessors, additions and alterations having been made whenever the advance of science has rendered them desirable. The typographical execution of the work will also be found to have undergone a similar improvement, and the work is now confidently presented as in every way worthy the position it has acquired as the standard American text-book on the Diseases of Females.

It contains a vast amount of practical knowledge, by one who has accurately observed and retained the experience of many years, and who tells the result in a free, familiar, and pleasant manner.—*Dublin Quarterly Journal.*

There is an off-hand fervor, a glow, and a warm-heartedness infecting the effort of Dr. Meigs, which is entirely captivating, and which absolutely hurries the reader through from beginning to end. Besides, the book teems with solid instruction, and it shows the very highest evidence of ability, viz., the clearness with which the information is presented. We know of no better test of one's understanding a subject than the evidence of the power of lucidly explaining it. The most elementary, as well as the obscurest subjects, under the pencil of Prof. Meigs, are isolated and made to stand out in such bold relief, as to produce distinct impressions upon the mind and memory of the reader.—*The Charleston Med. Journal.*

Professor Meigs has enlarged and amended this great work, for such it unquestionably is, having passed the ordeal of criticism at home and abroad, but been improved thereby; for in this new edition the author has introduced real improvements, and increased the value and utility of the book immeasurably. It presents so many novel, bright, and sparkling thoughts; such an exuberance of new ideas on almost every page, that we confess ourselves to have become enamored with the book and its author; and cannot withhold our congratulations from our Philadelphia confreres, that such a teacher is in their service.—*N. Y. Med. Gazette.*

BY THE SAME AUTHOR. (*Lately Published.*)

ON THE NATURE, SIGNS, AND TREATMENT OF CHILDBED FEVER.

In a Series of Letters addressed to the Students of his Class. In one handsome octavo volume, extra cloth, of 365 pages. $2 50.

The instructive and interesting author of this work, whose previous labors in the department of medicine which he so sedulously cultivates, have placed his countrymen under deep and abiding obligations, again challenges their admiration in the fresh and vigorous, attractive and racy pages before us. It is a delectable book. * * * This treatise upon child-bed fevers will have an extensive sale, being destined, as it deserves, to find a place in the library of every practitioner who scorns to lag in the rear of his brethren.—*Nashville Journal of Medicine and Surgery.*

This book will add more to his fame than either of those which bear his name. Indeed we doubt whether any material improvement will be made on the teachings of this volume for a century to come, since it is so eminently practical, and based on profound knowledge of the *science* and consummate skill in the *art* of healing, and ratified by an ample and extensive experience, such as few men have the industry or good fortune to acquire.—*N. Y. Med. Gazette.*

BY THE SAME AUTHOR; WITH COLORED PLATES.

A TREATISE ON ACUTE AND CHRONIC DISEASES OF THE NECK OF THE UTERUS.

With numerous plates, drawn and colored from nature in the highest style of art. In one handsome octavo volume, extra cloth. $4 50.

MAYNE'S DISPENSATORY AND THERAPEUTICAL REMEMBRANCER. Comprising the entire lists of Materia Medica, with every Practical Formula contained in the three British Pharmacopœias. Edited, with the addition of the Formulæ of the U. S. Pharmacopœia, by R. E. Griffith, M. D. 1 12mo. vol. ex. cl., 300 pp. 75 c.

MALGAIGNE'S OPERATIVE SURGERY, based on Normal and Pathological Anatomy. Translated from the French by Frederick Brittan, A. B., M. D. With numerous illustrations on wood In one handsome octavo volume, extra cloth, of nearly six hundred pages. $2 25.

MACLISE (JOSEPH), SURGEON.

SURGICAL ANATOMY. Forming one volume, very large imperial quarto. With sixty-eight large and splendid Plates, drawn in the best style and beautifully colored. Containing one hundred and ninety Figures, many of them the size of life. Together with copious and explanatory letter-press. Strongly and handsomely bound in extra cloth, being one of the cheapest and best executed Surgical works as yet issued in this country. $11 00.

*** The size of this work prevents its transmission through the post-office as a whole, but those who desire to have copies forwarded by mail, can receive them in five parts, done up in stout wrappers. Price $9 00.

One of the greatest artistic triumphs of the age in Surgical Anatomy.—*British American Medical Journal.*

Too much cannot be said in its praise; indeed, we have not language to do it justice.—*Ohio Medical and Surgical Journal.*

The most admirable surgical atlas we have seen. To the practitioner deprived of demonstrative dissections upon the human subject, it is an invaluable companion.—*N. J. Medical Reporter.*

The most accurately engraved and beautifully colored plates we have ever seen in an American book—one of the best and cheapest surgical works ever published.—*Buffalo Medical Journal.*

It is very rare that so elegantly printed, so well illustrated, and so useful a work, is offered at so moderate a price.—*Charleston Medical Journal.*

Its plates can boast a superiority which places them almost beyond the reach of competition.—*Medical Examiner.*

Every practitioner, we think, should have a work of this kind within reach.—*Southern Medical and Surgical Journal.*

No such lithographic illustrations of surgical regions have hitherto, we think, been given.—*Boston Medical and Surgical Journal.*

As a surgical anatomist, Mr. Maclise has probably no superior.—*British and Foreign Medico-Chirurgical Review.*

Of great value to the student engaged in dissecting, and to the surgeon at a distance from the means of keeping up his anatomical knowledge.—*Medical Times.*

The mechanical execution cannot be excelled.—*Transylvania Medical Journal.*

A work which has no parallel in point of accuracy and cheapness in the English language.—*N. Y. Journal of Medicine.*

To all engaged in the study or practice of their profession, such a work is almost indispensable.—*Dublin Quarterly Medical Journal.*

No practitioner whose means will admit should fail to possess it.—*Ranking's Abstract.*

Country practitioners will find these plates of immense value.—*N. Y. Medical Gazette.*

We are extremely gratified to announce to the profession the completion of this truly magnificent work, which, as a whole, certainly stands unrivalled, both for accuracy of drawing, beauty of coloring, and all the requisite explanations of the subject in hand.—*The New Orleans Medical and Surgical Journal.*

This is by far the ablest work on Surgical Anatomy that has come under our observation. We know of no other work that would justify a student, in any degree, for neglect of actual dissection. In those sudden emergencies that so often arise, and which require the instantaneous command of minute anatomical knowledge, a work of this kind keeps the details of the dissecting-room perpetually fresh in the memory.—*The Western Journal of Medicine and Surgery.*

☞ The very low price at which this work is furnished, and the beauty of its execution, require an extended sale to compensate the publishers for the heavy expenses incurred.

MOHR (FRANCIS), PH. D., AND REDWOOD (THEOPHILUS).

PRACTICAL PHARMACY. Comprising the Arrangements, Apparatus, and Manipulations of the Pharmaceutical Shop and Laboratory. Edited, with extensive Additions, by Prof. William Procter, of the Philadelphia College of Pharmacy. In one handsomely printed octavo volume, extra cloth, of 570 pages, with over 500 engravings on wood. $2 75.

MACKENZIE (W.), M. D.,

Surgeon Oculist in Scotland in ordinary to Her Majesty, &c. &c.

A PRACTICAL TREATISE ON DISEASES AND INJURIES OF THE EYE. To which is prefixed an Anatomical Introduction explanatory of a Horizontal Section of the Human Eyeball, by Thomas Wharton Jones, F. R. S. From the Fourth Revised and Enlarged London Edition. With Notes and Additions by Addinell Hewson, M. D., Surgeon to Wills Hospital, &c. &c. In one very large and handsome octavo volume, leather, raised bands, with plates and numerous wood-cuts. $5 25.

The treatise of Dr. Mackenzie indisputably holds the first place, and forms, in respect of learning and research, an Encyclopædia unequalled in extent by any other work of the kind, either English or foreign. —*Dixon on Diseases of the Eye.*

Few modern books on any department of medicine or surgery have met with such extended circulation, or have procured for their authors a like amount of European celebrity. The immense research which it displayed, the thorough acquaintance with the subject, practically as well as theoretically, and the able manner in which the author's stores of learning and experience were rendered available for general use, at once procured for the first edition, as well on the continent as in this country, that high position as a standard work which each successive edition has more firmly established, in spite of the attractions of several rivals of no mean ability. This, the fourth edition, has been in a great measure re-written; new matter, to the extent of one hundred and fifty pages, has been added, and in several instances formerly expressed opinions have been modified in accordance with the advances in the science which have been made of late years. Nothing worthy of repetition upon any branch of the subject appears to have escaped the author's notice. We consider it the duty of every one who has the love of his profession and the welfare of his patient at heart, to make himself familiar with this the most complete work in the English language upon the diseases of the eye. —*Med. Times and Gazette.*

The fourth edition of this standard work will no doubt be as fully appreciated as the three former editions. It is unnecessary to say a word in its praise, for the verdict has already been passed upon it by the most competent judges, and "Mackenzie on the Eye" has justly obtained a reputation which it is no figure of speech to call world-wide.—*British and Foreign Medico-Chirurgical Review.*

This new edition of Dr. Mackenzie's celebrated treatise on diseases of the eye, is truly a miracle of industry and learning. We need scarcely say that he has entirely exhausted the subject of his specialty. —*Dublin Quarterly Journal.*

MILLER (JAMES), F. R. S. E.,

Professor of Surgery in the University of Edinburgh, &c.

PRINCIPLES OF SURGERY.

Fourth American, from the third and revised Edinburgh edition. In one large and very beautiful volume, leather, of 700 pages, with two hundred and forty exquisite illustrations on wood. (*Just Issued*, 1856.) $3 75.

The extended reputation enjoyed by this work will be fully maintained by the present edition. Thoroughly revised by the author, it will be found a clear and compendious exposition of surgical science in its most advanced condition.

In connection with the recently issued third edition of the author's "Practice of Surgery," it forms a very complete system of Surgery in all its branches.

The work of Mr. Miller is too well and too favorably known among us, as one of our best text-books, to render any further notice of it necessary than the announcement of a new edition, the *fourth* in our country, a proof of its extensive circulation among us. As a concise and reliable exposition of the science of modern surgery, it stands deservedly high—we know not its superior.—*Boston Med. and Surg. Journal.*

It presents the most satisfactory exposition of the modern doctrines of the principles of surgery to be found in any volume in any language.—*N. Y. Journal of Medicine.*

The work takes rank with Watson's Practice of Physic; it certainly does not fall behind that great work in soundness of principle or depth of reasoning and research. No physician who values his reputation, or seeks the interests of his clients, can acquit himself before his God and the world without making himself familiar with the sound and philosophical views developed in the foregoing book.—*New Orleans Med. and Surg. Journal.*

Without doubt the ablest exposition of the principles of that branch of the healing art in any language. This opinion, deliberately formed after a careful study of the first edition, we have had no cause to change on examining the second. This edition has undergone thorough revision by the author; many expressions have been modified, and a mass of new matter introduced. The book is got up in the finest style, and is an evidence of the progress of typography in our country.—*Charleston Medical Journal and Review.*

BY THE SAME AUTHOR. (*Lately Published.*)

THE PRACTICE OF SURGERY.

A new American from the last Edinburgh edition. Illustrated by three hundred and nineteen engravings on wood. In one large octavo volume, leather, of over 700 pages. $3 75.

No encomium of ours could add to the popularity of Miller's Surgery. Its reputation in this country is unsurpassed by that of any other work, and, when taken in connection with the author's *Principles of Surgery*, constitutes a whole, without reference to which no conscientious surgeon would be willing to practice his art. The additions, by Dr. Sargent, have materially enhanced the value of the work.—*Southern Medical and Surgical Journal.*

It is seldom that two volumes have ever made so profound an impression in so short a time as the "Principles" and the "Practice" of Surgery by Mr. Miller—or so richly merited the reputation they have acquired. The author is an eminently sensible, practical, and well-informed man, who knows exactly what he is talking about and exactly how to talk it.—*Kentucky Medical Recorder.*

By the almost unanimous voice of the profession, his works, both on the principles and practice of surgery have been assigned the highest rank. If we were limited to but one work on surgery, that one should be Miller's, as we regard it as superior to all others.—*St. Louis Med. and Surg. Journal.*

The author, distinguished alike as a practitioner and writer, has in this and his "Principles," presented to the profession one of the most complete and reliable systems of Surgery extant. His style of writing is original, impressive, and engaging, energetic, concise, and lucid. Few have the faculty of condensing so much in small space, and at the same time so persistently holding the attention; indeed, he appears to make the very process of condensation a means of eliminating attractions. Whether as a text-book for students or a book of reference for practitioners, it cannot be too strongly recommended.—*Southern Journal of Med. and Phys. Sciences.*

MONTGOMERY (W. F.), M. D., M. R. I. A., &c.,

Professor of Midwifery in the King and Queen's College of Physicians in Ireland, &c.

AN EXPOSITION OF THE SIGNS AND SYMPTOMS OF PREGNANCY.

With some other Papers on Subjects connected with Midwifery. From the second and enlarged English edition. With two exquisite colored plates, and numerous wood-cuts. In one very handsome octavo volume, extra cloth, of nearly 600 pages. (*Now Ready*, 1857.) $3 75.

The present edition of this classical volume is fairly entitled to be regarded as a new work, every sentence having been carefully rewritten, and the whole increased to more than double the original size. The title of the work scarcely does justice to the extent and importance of the topics brought under consideration, embracing, with the exception of the operative procedures of midwifery, almost everything connected with obstetrics, either directly or incidentally; and there are few physicians who will not find in its pages much that will prove of great interest and value in their daily practice. The special Essays on the Period of Human Gestation, the Signs of Delivery, and the Spontaneous Amputation and other Lesions of the Fœtus in Utero present topics of the highest interest fully treated and beautifully illustrated.

In every point of mechanical execution the work will be found one of the handsomest yet issued from the American press.

A book unusually rich in practical suggestions.—*Am Journal Med. Sciences*, Jan. 1857.

These several subjects so interesting in themselves, and so important, every one of them, to the most delicate and precious of social relations, controlling often the honor and domestic peace of a family, the legitimacy of offspring, or the life of its parent, are all treated with an elegance of diction, fulness of illustrations, acuteness and justice of reasoning, unparalleled in obstetrics, and unsurpassed in medicine. The reader's interest can never flag, so fresh, and vigorous, and classical is our author's style; and one forgets, in the renewed charm of every page, that it, and every line, and every word has been weighed and reweighed through years of preparation; that this is of all others the book of Obstetric Law, on each of its several topics; on all points connected with pregnancy, to be everywhere received as a manual of special jurisprudence, at once announcing fact, affording argument, establishing precedent, and governing alike the juryman, advocate, and judge. It is not merely in its legal relations that we find this work so interesting. Hardly a page but that has its hints or facts important to the general practitioner; and not a chapter without especial matter for the anatomist, physiologist, or pathologist.—*N. A. Med.-Chir. Review*, March, 1857.

NEILL (JOHN), M. D.,

Surgeon to the Pennsylvania Hospital, &c.; and

FRANCIS GURNEY SMITH, M. D.,

Professor of Institutes of Medicine in the Pennsylvania Medical College.

AN ANALYTICAL COMPENDIUM OF THE VARIOUS BRANCHES OF MEDICAL SCIENCE; for the Use and Examination of Students. A new edition, revised and improved. In one very large and handsomely printed royal 12mo. volume, of about one thousand pages, with 374 wood-cuts. Strongly bound in leather, with raised bands. $3 00.

The very flattering reception which has been accorded to this work, and the high estimate placed upon it by the profession, as evinced by the constant and increasing demand which has rapidly exhausted two large editions, have stimulated the authors to render the volume in its present revision more worthy of the success which has attended it. It has accordingly been thoroughly examined, and such errors as had on former occasions escaped observation have been corrected, and whatever additions were necessary to maintain it on a level with the advance of science have been introduced. The extended series of illustrations has been still further increased and much improved, while, by a slight enlargement of the page, these various additions have been incorporated without increasing the bulk of the volume.

The work is, therefore, again presented as eminently worthy of the favor with which it has hitherto been received. As a book for daily reference by the student requiring a guide to his more elaborate text-books, as a manual for preceptors desiring to stimulate their students by frequent and accurate examination, or as a source from which the practitioners of older date may easily and cheaply acquire a knowledge of the changes and improvement in professional science, its reputation is permanently established.

The best work of the kind with which we are acquainted.—*Med. Examiner.*

Having made free use of this volume in our examinations of pupils, we can speak from experience in recommending it as an admirable compend for students, and as especially useful to preceptors who examine their pupils. It will save the teacher much labor by enabling him readily to recall all of the points upon which his pupils should be examined. A work of this sort should be in the hands of every one who takes pupils into his office with a view of examining them; and this is unquestionably the best of its class.—*Transylvania Med. Journal.*

In the rapid course of lectures, where work for the students is heavy, and review necessary for an examination, a compend is not only valuable, but it is almost a *sine qua non*. The one before us is, in most of the divisions, the most unexceptionable of all books of the kind that we know of. The newest and soundest doctrines and the latest improvements and discoveries are explicitly, though concisely, laid before the student. There is a class to whom we very sincerely commend this cheap book as worth its weight in silver—that class is the graduates in medicine of more than ten years' standing, who have not studied medicine since. They will perhaps find out from it that the science is not exactly now what it was when they left it off.—*The Stethoscope.*

NEILL (JOHN), M. D.,

Professor of Surgery in the Pennsylvania Medical College, &c.

OUTLINES OF THE VEINS AND LYMPHATICS. With handsome colored plates. 1 vol., cloth. $1 25.

OUTLINES OF THE NERVES. With handsome plates. 1 vol., cloth. $1 25.

NELIGAN (J. MOORE), M. D., M. R. I. A., &c.

(A splendid work. Just Issued.)

ATLAS OF CUTANEOUS DISEASES. In one beautiful quarto volume, extra cloth, with splendid colored plates, presenting nearly one hundred elaborate representations of disease. $4 50.

This beautiful volume is intended as a complete and accurate representation of all the varieties of Diseases of the Skin. While it can be consulted in conjunction with any work on Practice, it has especial reference to the author's "Treatise on Diseases of the Skin," so favorably received by the profession some years since. The publishers feel justified in saying that few more beautifully executed plates have ever been presented to the profession of this country.

The diagnosis of eruptive disease, however, under all circumstances, is very difficult. Nevertheless Dr. Neligan has certainly, "as far as possible," given a faithful and accurate representation of this class of diseases, and there can be no doubt that these plates will be of great use to the student and practitioner in drawing a diagnosis as to the class, order, and species to which the particular case may belong. While looking over the "Atlas" we have been induced to examine also the "Practical Treatise," and we are inclined to consider it a very superior work, combining accurate verbal description, with sound views of the pathology and treatment of eruptive diseases.—*Glasgow Med. Journal.*

The profession owes its thanks to the publishers of Neligan's Atlas of Cutaneous Diseases, for they have placed within its reach and at a moderate cost a most accurate and well delineated series of plates illustrating the eruptive disorders. These plates are all drawn from the life, and in many of them the daguerreotype has been employed with great success. Such works as these are especially useful to country practitioners, who have not an opportunity of seeing the rarer forms of cutaneous disease, and hence need the aid of illustrations to give them the requisite information on the subject. With these plates at hand, the inexperienced practitioner is enabled to discriminate with much accuracy, and he is thus, comparatively speaking, put on an equal footing with those who have had the opportunity of visiting the large hospitals of Europe and America.—*Va. Med. Journal*, June, 1856.

BY THE SAME AUTHOR.

A PRACTICAL TREATISE ON DISEASES OF THE SKIN. Second American edition. In one neat royal 12mo. volume, extra cloth, of 334 pages. $1 00.

☞ The two volumes will be sent by mail on receipt of *Five Dollars.*

OWEN ON THE DIFFERENT FORMS OF THE SKELETON, AND OF THE TEETH. One vol. royal 12mo., extra cloth, with numerous illustrations. (*Just Issued.*) $1 25.

(Now Complete.)

PEREIRA (JONATHAN), M. D., F. R. S., AND L. S.

THE ELEMENTS OF MATERIA MEDICA AND THERAPEUTICS.

Third American edition, enlarged and improved by the author; including Notices of most of the Medicinal Substances in use in the civilized world, and forming an Encyclopædia of Materia Medica. Edited, with Additions, by JOSEPH CARSON, M. D., Professor of Materia Medica and Pharmacy in the University of Pennsylvania. In two very large octavo volumes of 2100 pages, on small type, with about 500 illustrations on stone and wood, strongly bound in leather, with raised bands. $9 00.

Gentlemen who have the first volume are recommended to complete their copies without delay. The first volume will no longer be sold separate. Price of Vol. II. $5 00.

When we remember that Philology, Natural History, Botany, Chemistry, Physics, and the Microscope, are all brought forward to elucidate the subject, one cannot fail to see that the reader has here a work worthy of the name of an encyclopædia of Materia Medica. Our own opinion of its merits is that of its editors, and also that of the whole profession, both of this and foreign countries—namely, "that in copiousness of details, in extent, variety, and accuracy of information, and in lucid explanation of difficult and recondite subjects, it surpasses all other works on Materia Medica hitherto published." We cannot close this notice without alluding to the special additions of the American editor, which pertain to the prominent vegetable productions of this country, and to the directions of the United States Pharmacopœia, in connection with all the articles contained in the volume which are referred to by it. The illustrations have been increased, and this edition by Dr. Carson cannot well be regarded in any other light than that of a treasure which should be found in the library of every physician.—*New York Journal of Medical and Collateral Science.*

The third edition of his "Elements of Materia Medica, although completed under the supervision of others, is by far the most elaborate treatise in the English language, and will, while medical literature is cherished, continue a monument alike honorable to his genius, as to his learning and industry.—*American Journal of Pharmacy.*

The work, in its present shape, forms the most comprehensive and complete treatise on materia medica extant in the English language. — Dr. Pereira has been at great pains to introduce into his work, not only all the information on the natural, chemical, and commercial history of medicines, which might be serviceable to the physician and surgeon, but whatever might enable his readers to understand thoroughly the mode of preparing and manufacturing various articles employed either for preparing medicines, or for certain purposes in the arts connected with materia medica and the practice of medicine. The accounts of the physiological and therapeutic effects of remedies are given with great clearness and accuracy, and in a manner calculated to interest as well as instruct the reader.—*Edinburgh Medical and Surgical Journal.*

PEASLEE (E. R.), M. D.,

Professor of Physiology and General Pathology in the New York Medical College.

HUMAN HISTOLOGY, in its relations to Anatomy, Physiology, and Pathology;

for the use of Medical Students. With over four hundred illustrations. In one handsome octavo volume. *(Nearly Ready.)*

The author's object in this work has been to give a connected view of the simple chemical elements, of the immediate principles, of the simple structural elements, and of the proper tissues entering into the composition of the fluids and the solids of the human body; and also, to associate with the structural elements and tissues their functions while in health, and the changes they undergo in disease. It will, therefore, be seen that the subject of the volume is one, the growing importance of which, as the basis of all true medical science, demands for it a separate volume. The book will therefore supply an acknowledged deficiency in medical text-books, while the name of the author, and his experience as a teacher for the last thirteen years, is a guarantee that it will be thoroughly adapted to the use of the student.

PIRRIE (WILLIAM), F. R. S. E.,

Professor of Surgery in the University of Aberdeen.

THE PRINCIPLES AND PRACTICE OF SURGERY.

Edited by JOHN NEILL, M. D., Professor of Surgery in the Penna. Medical College, Surgeon to the Pennsylvania Hospital, &c. In one very handsome octavo volume, leather, of 780 pages, with 316 illustrations. $3 75.

We know of no other surgical work of a reasonable size, wherein there is so much theory and practice, or where subjects are more soundly or clearly taught.—*The Stethoscope.*

There is scarcely a disease of the bones or soft parts, fracture, or dislocation, that is not illustrated by accurate wood-engravings. Then, again, every instrument employed by the surgeon is thus represented. These engravings are not only correct, but really beautiful, showing the astonishing degree of perfection to which the art of wood-engraving has arrived. Prof. Pirrie, in the work before us, has elaborately discussed the principles of surgery, and a safe and effectual practice predicated upon them. Perhaps no work upon this subject heretofore issued is so full upon the science of the art of surgery.—*Nashville Journal of Medicine and Surgery.*

One of the best treatises on surgery in the English language.—*Canada Med. Journal.*

Our impression is, that, as a manual for students, Pirrie's is the best work extant.—*Western Med. and Surg. Journal.*

PARKER (LANGSTON),

Surgeon to the Queen's Hospital, Birmingham.

THE MODERN TREATMENT OF SYPHILITIC DISEASES, BOTH PRIMARY AND SECONDARY;

comprising the Treatment of Constitutional and Confirmed Syphilis, by a safe and successful method. With numerous Cases, Formulæ, and Clinical Observations. From the Third and entirely rewritten London edition. In one neat octavo volume, extra cloth, of 316 pages. $1 75.

PARRISH (EDWARD),

Lecturer on Practical Pharmacy and Materia Medica in the Pennsylvania Academy of Medicine, &c.

AN INTRODUCTION TO PRACTICAL PHARMACY. Designed as a Text-Book for the Student, and as a Guide for the Physician and Pharmaceutist. With many Formulæ and Prescriptions. In one handsome octavo volume, extra cloth, of 550 pages, with 243 Illustrations. $2 75.

A careful examination of this work enables us to speak of it in the highest terms, as being the best treatise on practical pharmacy with which we are acquainted, and an invaluable *vade-mecum*, not only to the apothecary and to those practitioners who are accustomed to prepare their own medicines, but to every medical man and medical student. Throughout the work are interspersed valuable tables, useful formulæ, and practical hints, and the whole is illustrated by a large number of excellent wood-engravings.—*Boston Med. and Surg. Journal.*

This is altogether one of the most useful books we have seen. It is just what we have long felt to be needed by apothecaries, students, and practitioners of medicine, most of whom in this country have to put up their own prescriptions. It bears, upon every page, the impress of practical knowledge, conveyed in a plain common sense manner, and adapted to the comprehension of all who may read it. No detail has been omitted, however trivial it may seem, although really important to the dispenser of medicine.—*Southern Med. and Surg. Journal.*

To both the country practitioner and the city apothecary this work of Mr. Parrish is a godsend. A careful study of its contents will give the young graduate a familiarity with the value and mode of administering his prescriptions, which will be of as much use to his patient as to himself.—*Va. Med. Journal.*

Mr. Parrish has rendered a very acceptable service to the practitioner and student, by furnishing this book, which contains the leading facts and principles of the science of Pharmacy, conveniently arranged for study, and with special reference to those features of the subject which possess an especial practical interest to the physician. It furnishes the student, at the commencement of his studies, with that information which is of the greatest importance in initiating him into the domain of Chemistry and Materia Medica; it familiarizes him with the compounding of drugs, and supplies those minutiæ which but few practitioners can impart. The junior practitioner will, also, find this volume replete with instruction.—*Charleston Med. Journal and Review*, Mar. 1856.

There is no useful information in the details of the apothecary's or country physician's office conducted according to science that is omitted. The young physician will find it an encyclopedia of indispensable medical knowledge, from the purchase of a spatula to the compounding of the most learned prescriptions. The work is by the ablest pharmaceutist in the United States, and must meet with an immense sale.—*Nashville Journal of Medicine*, April, 1856.

We are glad to receive this excellent work. It will supply a want long felt by the profession, and especially by the student of Pharmacy. A large majority of physicians are obliged to compound their own medicines, and to them a work of this kind is indispensable.—*N. O. Medical and Surgical Journal.*

We cannot say but that this volume is one of the most welcome and appropriate which has for a long time been issued from the press. It is a work which we doubt not will at once secure an extensive circulation, as it is designed not only for the druggist and pharmaceutist, but also for the great body of practitioners throughout the country, who not only have to prescribe medicines, but in the majority of instances have to rely upon their own resources—whatever these may be—not only to compound, but also to manufacture the remedies they are called upon to administer. The author has not mistaken the idea in writing this volume, as it is alike useful and invaluable to those engaged in the active pursuits of the profession, and to those preparing to enter upon the field of professional labors.—*American Lancet*, March 24, 1856.

RICORD (P.), M. D.,

A TREATISE ON THE VENEREAL DISEASE. By JOHN HUNTER, F. R. S.

With copious Additions, by PH. RICORD, M. D. Edited, with Notes, by FREEMAN J. BUMSTEAD, M. D. In one handsome octavo volume, extra cloth, of 520 pages, with plates. $3 25.

Every one will recognize the attractiveness and value which this work derives from thus presenting the opinions of these two masters side by side. But, it must be admitted, what has made the fortune of the book, is the fact that it contains the "most complete embodiment of the veritable doctrines of the Hôpital du Midi," which has ever been made public. The doctrinal ideas of M. Ricord, ideas which, if not universally adopted, are incontestably dominant, have heretofore only been interpreted by more or less skilful secretaries, sometimes accredited and sometimes not.

In the notes to Hunter, the master substitutes himself for his interpreters, and gives his original thoughts to the world in a lucid and perfectly intelligible manner. In conclusion we can say that this is incontestably the best treatise on syphilis with which we are acquainted, and, as we do not often employ the phrase, we may be excused for expressing the hope that it may find a place in the library of every physician.—*Virginia Med. and Surg Journal.*

BY THE SAME AUTHOR.

ILLUSTRATIONS OF SYPHILITIC DISEASE. Translated by THOMAS F. BETTON, M. D. With fifty large quarto colored plates. In one large quarto volume, extra cloth. $15 00.

LETTERS ON SYPHILIS, addressed to the Chief Editor of the Union Médicale. Translated by W. P. LATTIMORE, M. D. In one neat octavo volume, of 270 pages, extra cloth. $2 00.

RIGBY (EDWARD), M. D.,

Senior Physician to the General Lying-in Hospital, &c.

A SYSTEM OF MIDWIFERY. With Notes and Additional Illustrations.

Second American Edition. One volume octavo, extra cloth, 422 pages. $2 50.

BY THE SAME AUTHOR. (*Now Ready*, 1857.)

ON THE CONSTITUTIONAL TREATMENT OF FEMALE DISEASES.

In one neat royal 12mo. volume, extra cloth, of about 250 pages. $1 00.

The aim of the author has been throughout to present sound practical views of the important subjects under consideration; and without entering into theoretical disputations and disquisitions to embody the results of his long and extended experience in such a condensed form as would be easily accessible to the practitioner.

ROYLE'S MATERIA MEDICA AND THERAPEUTICS; including the Preparations of the Pharmacopœias of London, Edinburgh, Dublin, and of the United States. With many new medicines. Edited by JOSEPH CARSON, M. D. With ninety-eight illustrations. In one large octavo volume, extra cloth, of about 700 pages. $3 00.

RAMSBOTHAM (FRANCIS H.), M. D.

THE PRINCIPLES AND PRACTICE OF OBSTETRIC MEDICINE AND SURGERY, in reference to the Process of Parturition. A new and enlarged edition, thoroughly revised by the Author. With Additions by W. V. KEATING, M. D. In one large and handsome imperial octavo volume, of 650 pages, strongly bound in leather, with raised bands; with sixty-four beautiful Plates, and numerous Wood-cuts in the text, containing in all nearly two hundred large and beautiful figures. (*Lately Issued*, 1856.) $5 00.

In calling the attention of the profession to the new edition of this standard work, the publishers would remark that no efforts have been spared to secure for it a continuance and extension of the remarkable favor with which it has been received. The last London issue, which was considerably enlarged, has received a further revision from the author, especially for this country. Its passage through the press here has been supervised by Dr. Keating, who has made numerous additions with a view of presenting more fully whatever was necessary to adapt it thoroughly to American modes of practice. In its mechanical execution, n like superiority over former editions will be found.

From Prof. Hodge, of the University of Pa.

To the American public, it is most valuable, from its intrinsic undoubted excellence, and as being the best authorized exponent of British Midwifery. Its circulation will, I trust, be extensive throughout our country.

The publishers have shown their appreciation of the merits of this work and secured its success by the truly elegant style in which they have brought it out, excelling themselves in its production, especially in its plates. It is dedicated to Prof. Meigs, and has the emphatic endorsement of Prof. Hodge, as the best exponent of British Midwifery. We know of no text-book which deserves in all respects to be more highly recommended to students, and we could wish to see it in the hands of every practitioner, for they will find it invaluable for reference.—*Med. Gazette.*

But once in a long time some brilliant genius rears his head above the horizon of science, and illuminates and purifies every department that he investigates; and his works become types, by which innumerable imitators model their feeble productions. Such a genius we find in the younger Ramsbotham, and such a type we find in the work now before us. The binding, paper, type, the engravings and wood-cuts are all so excellent as to make this book one of the finest specimens of the art of printing that have given such a world-wide reputation to its enterprising and liberal publishers. We welcome Ramsbotham's Principles and Practice of Obstetric Medicine and Surgery to our library, and confidently recommend it to our readers, with the assurance that it will not disappoint their most sanguine expectations.—*Western Lancet.*

It is unnecessary to say anything in regard to the utility of this work. It is already appreciated in our country for the value of the matter, the clearness of its style, and the fulness of its illustrations. To the physician's library it is indispensable, while to the student as a text-book, from which to extract the material for laying the foundation of an education on obstetrical science, it has no superior.—*Ohio Med. and Surg. Journal.*

We will only add that the student will learn from it all he need to know, and the practitioner will find it, as a book of reference, surpassed by none other.—*Stethoscope.*

The character and merits of Dr. Ramsbotham's work are so well known and thoroughly established, that comment is unnecessary and praise superfluous. The illustrations, which are numerous and accurate, are executed in the highest style of art. We cannot too highly recommend the work to our readers.—*St. Louis Med. and Surg. Journal.*

ROKITANSKY (CARL), M. D.,

Curator of the Imperial Pathological Museum, and Professor at the University of Vienna, &c.

A MANUAL OF PATHOLOGICAL ANATOMY. Four volumes, octavo, bound in two, extra cloth, of about 1200 pages. Translated by W. E. SWAINE, EDWARD SIEVEKING, C. H. MOORE, and G. E. DAY. (*Just Issued.*) $5 50

To render this large and important work more easy of reference, and at the same time less cumbrous and costly, the four volumes have been arranged in two, retaining, however, the separate paging, &c.

The publishers feel much pleasure in presenting to the profession of the United States the great work of Prof. Rokitansky, which is universally referred to as the standard of authority by the pathologists of all nations. Under the auspices of the Sydenham Society of London, the combined labor of four translators has at length overcome the almost insuperable difficulties which have so long prevented the appearance of the work in an English dress. To a work so widely known, eulogy is unnecessary, and the publishers would merely state that it is said to contain the results of not less than THIRTY THOUSAND *post-mortem* examinations made by the author, diligently compared, generalized, and wrought into one complete and harmonious system.

The profession is too well acquainted with the reputation of Rokitansky's work to need our assurance that this is one of the most profound, thorough, and valuable books ever issued from the medical press. It is *sui generis*, and has no standard of comparison. It is only necessary to announce that it is issued in a form as cheap as is compatible with its size and preservation, and its sale follows as a matter of course. No library can be called complete without it.—*Buffalo Med. Journal.*

An attempt to give our readers any adequate idea of the vast amount of instruction accumulated in these volumes, would be feeble and hopeless. The effort of the distinguished author to concentrate in a small space his great fund of knowledge, has so charged his text with valuable truths, that any attempt of a reviewer to epitomize is at once paralyzed, and must end in a failure.—*Western Lancet.*

As this is the highest source of knowledge upon the important subject of which it treats, no real student can afford to be without it. The American publishers have entitled themselves to the thanks of the profession of their country, for this timeous and beautiful edition.—*Nashville Journal of Medicine.*

As a book of reference, therefore, this work must prove of inestimable value, and we cannot too highly recommend it to the profession.—*Charleston Med. Journal and Review*, Jan. 1856.

This book is a necessity to every practitioner.—*Am. Med. Monthly.*

SCHOEDLER (FRIEDRICH), PH. D.,

Professor of the Natural Sciences at Worms, &c.

THE BOOK OF NATURE; an Elementary Introduction to the Sciences of Physics, Astronomy, Chemistry, Mineralogy, Geology, Botany, Zoology, and Physiology. First American edition, with a Glossary and other Additions and Improvements; from the second English edition. Translated from the sixth German edition, by HENRY MEDLOCK, F. C. S., &c. In one volume, small octavo, extra cloth, pp. 692, with 679 illustrations. $1 80.

SMITH (HENRY H.), M. D.,

Professor of Surgery in the University of Pennsylvania, &c.

MINOR SURGERY; or, Hints on the Every-day Duties of the Surgeon.

Illustrated by two hundred and forty-seven illustrations. Third and enlarged edition. In one handsome royal 12mo. volume. pp. 456. In leather, $2 25; extra cloth, $2 00.

And a capital little book it is. . . Minor Surgery, we repeat, is really Major Surgery, and anything which teaches it is worth having. So we cordially recommend this little book of Dr. Smith's.—*Med.-Chir. Review.*

This beautiful little work has been compiled with a view to the wants of the profession in the matter of bandaging, &c., and well and ably has the author performed his labors. Well adapted to give the requisite information on the subjects of which it treats.—*Medical Examiner.*

The directions are plain, and illustrated throughout with clear engravings.—*London Lancet.*

One of the best works they can consult on the subject of which it treats.—*Southern Journal of Medicine and Pharmacy.*

A work such as the present is therefore highly useful to the student, and we commend this one to their attention.—*American Journal of Medical Sciences.*

No operator, however eminent, need hesitate to consult this unpretending yet excellent book. Those who are young in the business would find Dr. Smith's treatise a necessary companion, after once understanding its true character.—*Boston Med. and Surg. Journal.*

No young practitioner should be without this little volume; and we venture to assert, that it may be consulted by the senior members of the profession with more real benefit, than the more voluminous works.—*Western Lancet.*

BY THE SAME AUTHOR, AND

HORNER (WILLIAM E.), M. D.,

Late Professor of Anatomy in the University of Pennsylvania.

AN ANATOMICAL ATLAS, illustrative of the Structure of the Human Body.

In one volume, large imperial octavo, extra cloth, with about six hundred and fifty beautiful figures. $3 00.

These figures are well selected, and present a complete and accurate representation of that wonderful fabric, the human body. The plan of this Atlas, which renders it so peculiarly convenient for the student, and its superb artistical execution, have been already pointed out. We must congratulate the student upon the completion of this Atlas, as it is the most convenient work of the kind that has yet appeared; and we must add, the very beautiful manner in which it is "got up" is so creditable to the country as to be flattering to our national pride.—*American Medical Journal.*

SARGENT (F. W.), M. D.

ON BANDAGING AND OTHER OPERATIONS OF MINOR SURGERY.

Second edition, enlarged. One handsome royal 12mo. vol., of nearly 400 pages, with 182 woodcuts. Extra cloth, $1 40; leather, $1 50.

This very useful little work has long been a favorite with practitioners and students. The recent call for a new edition has induced its author to make numerous important additions. A slight alteration in the size of the page has enabled him to introduce the new matter, to the extent of some fifty pages of the former edition, at the same time that his volume is rendered still more compact than its less comprehensive predecessor. A double gain in thus effected, which, in a *vade-mecum* of this kind, is a material improvement.—*Am. Medical Journal.*

Sargent's Minor Surgery has always been popular, and deservedly so. It furnishes that knowledge of the most frequently requisite performances of surgical art which cannot be entirely understood by attending clinical lectures. The art of bandaging, which is regularly taught in Europe, is very frequently overlooked by teachers in this country; the student and junior practitioner, therefore, may often require that knowledge which this little volume so tersely and happily supplies. It is neatly printed and copiously illustrated by the enterprising publishers, and should be possessed by all who desire to be thoroughly conversant with the details of this branch of our art.—*Charleston Med. Journ. and Review*, March, 1856.

A work that has been so long and favorably known to the profession as Dr. Sargent's Minor Surgery, needs no commendation from us. We would remark, however, in this connection, that minor surgery seldom gets that attention in our schools that its importance deserves. Our larger works are also very defective in their teaching on these small practical points. This little book will supply the void which all must feel who have not studied its pages.—*Western Lancet*, March, 1856.

We confess our indebtedness to this little volume on many occasions, and can warmly recommend it to our readers, as it is not above the consideration of the oldest and most experienced.—*American Lancet*, March, 1856.

SKEY'S OPERATIVE SURGERY. In one very handsome octavo volume, extra cloth, of over 650 pages, with about one hundred wood-cuts. $3 25.

STANLEY'S TREATISE ON DISEASES OF THE BONES. In one volume, octavo, extra cloth, 286 pages. $1 50.

SOLLY ON THE HUMAN BRAIN; its Structure, Physiology, and Diseases. From the Second and much enlarged London edition. In one octavo volume, extra cloth, of 500 pages, with 120 wood-cuts. $2 00.

SIMON'S GENERAL PATHOLOGY, as conducive to the Establishment of Rational Principles for the prevention and Cure of Disease. In one neat octavo volume, extra cloth, of 212 pages. $1 25.

STILLÉ (ALFRED), M. D.

PRINCIPLES OF GENERAL AND SPECIAL THERAPEUTICS

In handsome octavo. (*Preparing.*)

SIBSON (FRANCIS), M. D.,

Physician to St. Mary's Hospital.

MEDICAL ANATOMY. Illustrating the Form, Structure, and Position of the Internal Organs in Health and Disease.

In large imperial quarto, with splendid colored plates. To match "Maclise's Surgical Anatomy." Part I. (*Preparing.*)

SHARPEY (WILLIAM), M. D., JONES QUAIN, M. D., AND RICHARD QUAIN, F. R. S., &c.

HUMAN ANATOMY. Revised, with Notes and Additions, by JOSEPH LEIDY, M. D., Professor of Anatomy in the University of Pennsylvania. Complete in two large octavo volumes, leather, of about thirteen hundred pages. Beautifully illustrated with over five hundred engravings on wood. $6 00.

It is indeed a work calculated to make an era in anatomical study, by placing before the student every department of his science, with a view to the relative importance of each; and so skilfully have the different parts been interwoven, that no one who makes this work the basis of his studies, will hereafter have any excuse for neglecting or undervaluing any important particulars connected with the structure of the human frame; and whether the bias of his mind lead him in a more especial manner to surgery, physic, or physiology, he will find here a work at once so comprehensive and practical as to defend him from exclusiveness on the one hand, and pedantry on the other.—*Journal and Retrospect of the Medical Sciences.*

We have no hesitation in recommending this treatise on anatomy as the most complete on that subject in the English language; and the only one, perhaps, in any language, which brings the state of knowledge forward to the most recent discoveries.—*The Edinburgh Med. and Surg. Journal.*

SMITH (W. TYLER), M. D.,

Physician Accoucheur to St. Mary's Hospital, &c.

ON PARTURITION, AND THE PRINCIPLES AND PRACTICE OF OBSTETRICS. In one royal 12mo. volume, extra cloth, of 400 pages. $1 25.

BY THE SAME AUTHOR.

A PRACTICAL TREATISE ON THE PATHOLOGY AND TREATMENT OF LEUCORRHŒA. With numerous illustrations. In one very handsome octavo volume, extra cloth, of about 250 pages. $1 50.

We hail the appearance of this practical and invaluable work, therefore, as a real acquisition to our medical literature.—*Medical Gazette.*

TAYLOR (ALFRED S.), M. D., F. R. S.,

Lecturer on Medical Jurisprudence and Chemistry in Guy's Hospital.

MEDICAL JURISPRUDENCE. Fourth American, from the fifth improved and enlarged English Edition. With Notes and References to American Decisions, by EDWARD HARTSHORNE, M. D. In one large octavo volume, leather, of over seven hundred pages. (*Just Issued*, 1856.) $3 00.

This standard work has lately received a very thorough revision at the hands of the author, who has introduced whatever was necessary to render it complete and satisfactory in carrying out the objects in view. The editor has likewise used every exertion to make it equally thorough with regard to all matters relating to the practice of this country. In doing this, he has carefully examined all that has appeared on the subject since the publication of the last edition, and has incorporated all the new information thus presented. The work has thus been considerably increased in size, notwithstanding which, it has been kept at its former very moderate price, and in every respect it will be found worthy of a continuance of the remarkable favor which has carried it through so many editions on both sides of the Atlantic. A few notices of the former editions are appended.

We know of no work on Medical Jurisprudence which contains in the same space anything like the same amount of valuable matter.—*N. Y. Journal of Medicine.*

No work upon the subject can be put into the hands of students either of law or medicine which will engage them more closely or profitably; and none could be offered to the busy practitioner of either calling, for the purpose of casual or hasty reference, that would be more likely to afford the aid desired. We therefore recommend it as the best and safest manual for daily use.—*American Journal of Medical Sciences.*

So well is this work known to the members both of the medical and legal professions, and so highly is it appreciated by them, that it cannot be necessary for us to say a word in its commendation; its having already reached a fourth edition being the best possible testimony in its favor. The author has obviously subjected the entire work to a very careful revision.—*Brit. and Foreign Med. Chirurg. Review.*

This work of Dr. Taylor's is generally acknowledged to be one of the ablest extant on the subject of medical jurisprudence. It is certainly one of the most attractive books that we have met with; supplying so much both to interest and instruct, that we do not hesitate to affirm that after having once commenced its perusal, few could be prevailed upon to desist before completing it. In the last London edition, all the newly observed and accurately recorded facts have been inserted, including much that is recent of Chemical, Microscopical, and Pathological research, besides papers on numerous subjects never before published.—*Charleston Medical Journal and Review.*

It is not excess of praise to say that the volume before us is the very best treatise extant on Medical Jurisprudence. In saying this, we do not wish to be understood as detracting from the merits of the excellent works of Beck, Ryan, Traill, Guy, and others; but in interest and value we think it must be conceded that Taylor is superior to anything that has preceded it. The author is already well known to the profession by his valuable treatise on Poisons; and the present volume will add materially to his high reputation for accurate and extensive knowledge and discriminating judgment.—*N. W. Medical and Surgical Journal.*

BY THE SAME AUTHOR.

ON POISONS, IN RELATION TO MEDICAL JURISPRUDENCE AND MEDICINE. Edited, with Notes and Additions, by R. E. GRIFFITH, M. D. In one large octavo volume, leather, of 688 pages. $3 00

TODD (R. B.), M. D., F. R. S., &c.

CLINICAL LECTURES ON CERTAIN DISEASES OF THE URINARY ORGANS AND ON DROPSIES. In one octavo volume. (*Now Ready*, 1857.) $1 50.

The valuable practical nature of Dr. Todd's writings have deservedly rendered them favorites with the profession, and the present volume, embodying the medical aspects of a class of diseases not elsewhere to be found similarly treated, can hardly fail to supply a want long felt by the practitioner.

Now Complete (April, 1857.)

TODD (ROBERT BENTLEY), M. D., F. R. S.,

Professor of Physiology in King's College, London; and

WILLIAM BOWMAN, F. R. S.,

Demonstrator of Anatomy in King's College, London.

THE PHYSIOLOGICAL ANATOMY AND PHYSIOLOGY OF MAN. With

about three hundred large and beautiful illustrations on wood. Complete in one large octavo volume, of 950 pages, leather. Price $4 50.

The very great delay which has occurred in the completion of this work has arisen from the desire of the authors to verify by their own examination the various questions and statements presented, thus rendering the work one of peculiar value and authority. By the wideness of its scope and the accuracy of its facts it thus occupies a position of its own, and becomes necessary to all physiological students.

☞ Gentlemen who have received portions of this work, as published in the "MEDICAL NEWS AND LIBRARY," can now complete their copies, if immediate application be made. It will be furnished as follows, free by mail, in paper covers, with cloth backs.

PARTS I., II., III. (pp. 25 to 552), $2 50.
PART IV. (pp. 553 to end, with Title, Preface, Contents, &c.), $2 00.
Or, PART IV., SECTION II. (pp. 725 to end, with Title, Preface, Contents, &c.), $1 25.

In the present part (third) some of the most difficult subjects in Anatomy and Physiology are handled in the most masterly manner. Its authors have stated that this work was intended "for the use of the student and practitioner in medicine and surgery," and we can recommend it to both, confident that it is the most perfect work of its kind. We cannot conclude without strongly recommending the present work to all classes of our readers, recognizing talent and depth of research in every page, and believing, as we do, that the diffusion of such knowledge will certainly tend to elevate the sciences of Medicine and Surgery.—*Dublin Quarterly Journal of Medical Sciences.*

TANNER (T. H.), M. D.,

Physician to the Hospital for Women, &c.

A MANUAL OF CLINICAL MEDICINE AND PHYSICAL DIAGNOSIS.

To which is added The Code of Ethics of the American Medical Association. Second American Edition. In one neat volume, small 12mo. Price in extra cloth, 87½ cents; flexible style, for the pocket, 80 cents.

Dr. Tanner has, in a happy and successful manner, indicated the leading particulars to which, in the clinical study of a case of disease, the attention of the physician is to be directed, the value and import of the various abnormal phenomena detected, and the several instrumental and accessory means which may be called into requisition to facilitate diagnosis and increase its certainty.—*Am. Journal of Med. Sciences.*

The work is an honor to its writer, and must obtain a wide circulation by its intrinsic merit alone. Suited alike to the wants of students and practitioners, it has only to be seen, to win for itself a place upon the shelves of every medical library. Nor will it be "shelved" long at a time; if we mistake not, it will be found, in the best sense of the homely but expressive word, "handy." The style is admirably clear, while it is so sententious as not to burden the memory. The arrangement is, to our mind, unexceptionable. The work, in short, deserves the heartiest commendation.—*Boston Med. and Surg. Journal.*

WATSON (THOMAS), M. D., &c.

LECTURES ON THE PRINCIPLES AND PRACTICE OF PHYSIC.

Third American edition, revised, with Additions, by D. FRANCIS CONDIE, M. D., author of a "Treatise on the Diseases of Children," &c. In one octavo volume, of nearly eleven hundred large pages, strongly bound with raised bands. $3 25.

To say that it is the very best work on the subject now extant, is but to echo the sentiment of the medical press throughout the country.—*N. O. Medical Journal.*

Of the text-books recently republished Watson is very justly the principal favorite.—*Holmes's Rep. to Nat. Med. Assoc.*

By universal consent the work ranks among the very best text-books in our language.—*Illinois and Indiana Med. Journal.*

Regarded on all hands as one of the very best, if not the very best, systematic treatise on practical medicine extant.—*St. Louis Med. Journal.*

Confessedly one of the very best works on the principles and practice of physic in the English or any other language.—*Med. Examiner.*

As a text-book it has no equal; as a compendium of pathology and practice no superior.—*New York Annalist.*

We know of no work better calculated for being placed in the hands of the student, and for a text-book; on every important point the author seems to have posted up his knowledge to the day.—*Amer. Med. Journal.*

One of the most practically useful books that ever was presented to the student.—*N. Y. Med. Journal.*

WHITEHEAD ON THE CAUSES AND TREATMENT OF ABORTION AND STERILITY. Second American Edition. In one volume, octavo, extra cloth, pp. 308. $1 75.

WALSHE ON DISEASES OF THE HEART, LUNGS, AND APPENDAGES; their Symptoms and Treatment. In one handsome volume, extra cloth, large royal 12mo., 512 pages. $1 50.

WHAT TO OBSERVE

AT THE BEDSIDE AND AFTER DEATH, IN MEDICAL CASES.

Published under the authority of the London Society for Medical Observation. A new American, from the second and revised London edition. In one very handsome volume, royal 12mo., extra cloth. $1 00.

To the observer who prefers accuracy to blunders and precision to carelessness, this little book is invaluable.—*N. H. Journal of Medicine.*

One of the finest aids to a young practitioner we have ever seen.—*Peninsular Journal of Medicine.*

WILSON (ERASMUS), M. D., F. R. S.,

Lecturer on Anatomy, London.

A SYSTEM OF HUMAN ANATOMY, General and Special. Fourth American, from the last English edition. Edited by PAUL B. GODDARD, A. M., M. D. With two hundred and fifty illustrations. Beautifully printed, in one large octavo volume, leather, of nearly six hundred pages. $3 00.

In many, if not all the Colleges of the Union, it has become a standard text-book. This, of itself, is sufficiently expressive of its value. A work very desirable to the student; one, the possession of which will greatly facilitate his progress in the study of Practical Anatomy.—*New York Journal of Medicine.*

Its author ranks with the highest on Anatomy.—*Southern Medical and Surgical Journal.*

It offers to the student all the assistance that can be expected from such a work.—*Medical Examiner.*

The most complete and convenient manual for the student we possess.—*American Journal of Medical Science.*

In every respect, this work as an anatomical guide for the student and practitioner, merits our warmest and most decided praise.—*London Medical Gazette.*

BY THE SAME AUTHOR. (*Just Issued.*)

THE DISSECTOR'S MANUAL; or, Practical and Surgical Anatomy. Third American, from the last revised and enlarged English edition. Modified and rearranged, by WILLIAM HUNT, M. D., Demonstrator of Anatomy in the University of Pennsylvania. In one large and handsome royal 12mo. volume, leather, of 582 pages, with 154 illustrations. $2 00.

The modifications and additions which this work has received in passing recently through the author's hands, is sufficiently indicated by the fact that it is enlarged by more than one hundred pages, notwithstanding that it is printed in smaller type, and with a greatly enlarged page.

It remains only to add, that after a careful examination, we have no hesitation in recommending this work to the notice of those for whom it has been expressly written—the students—as a guide possessing very superior claims, well calculated to facilitate their studies, and render their labor less irksome, by constantly keeping before them definite objects of interest.—*The Lancet.*

BY THE SAME AUTHOR. (*Now Ready*, May, 1857.)

ON DISEASES OF THE SKIN. Fourth and enlarged American, from the last and improved London edition. In one large octavo volume, of 650 pages, extra cloth, $2 75.

This volume in passing for the fourth time through the hands of the author, has received a careful revision, and has been greatly enlarged and improved. About one hundred and fifty pages have been added, including new chapters on Classification, on General Pathology, on General Therapeutics, on Furuncular Eruptions, and on Diseases of the Nails, besides extensive additions throughout the text, wherever they have seemed desirable, either from former omissions or from the progress of science and the increased experience of the author. Appended to the volume will also now be found a collection of SELECTED FORMULÆ, consisting for the most part of prescriptions of which the author has tested the value.

In the present edition Mr. Wilson presents us with the results of his matured experience gained after an extensive acquaintance with the pathology and treatment of cutaneous affections; and we have now before us not merely a reprint of his former publications, but an entirely new and rewritten volume. Thus, the whole history of the diseases affecting the skin, whether they originate in that structure or are the mere manifestations of derangement of internal organs, is brought under notice, and the book includes a mass of information which is spread over a great part of the domain of Medical and Surgical Pathology. We can safely recommend it to the profession as the best work on the subject now in existence in the English language.—*London Med. Times and Gazette*, March 28, 1857.

ALSO, JUST READY,

A SERIES OF PLATES ILLUSTRATING WILSON ON DISEASES OF THE SKIN; consisting of nineteen beautifully executed plates, of which twelve are exquisitely colored, presenting the Normal Anatomy and Pathology of the Skin, and containing accurate representations of about one hundred varieties of disease, most of them the size of nature. Price in cloth $4 25.

In beauty of drawing and accuracy and finish of coloring these plates will be found superior to anything of the kind as yet issued in this country.

The plates by which this edition is accompanied leave nothing to be desired, so far as excellence of delineation and perfect accuracy of illustration are concerned.—*Medico-Chirurgical Review.*

Of these plates it is impossible to speak too highly. The representations of the various forms of cutaneous disease are singularly accurate, and the coloring exceeds almost anything we have met with in point of delicacy and finish.—*British and Foreign Medical Review.*

BY THE SAME AUTHOR.

ON CONSTITUTIONAL AND HEREDITARY SYPHILIS, AND ON SYPHILITIC ERUPTIONS. In one small octavo volume, extra cloth, beautifully printed, with four exquisite colored plates, presenting more than thirty varieties of syphilitic eruptions. $2 25.

BY THE SAME AUTHOR. (*Just Issued.*)

HEALTHY SKIN; A Popular Treatise on the Skin and Hair, their Preservation and Management. Second American, from the fourth London edition. One neat volume, royal 12mo., extra cloth, of about 300 pages, with numerous illustrations. $1 00; paper cover, 75 cents.

WILDE (W. R.),

Surgeon to St. Mark's Ophthalmic and Aural Hospital, Dublin.

AURAL SURGERY, AND THE NATURE AND TREATMENT OF DISEASES OF THE EAR. In one handsome octavo volume, extra cloth, of 476 pages, with illustrations. $2 80.

This work certainly contains more information on the subject to which it is devoted than any other with which we are acquainted. We feel grateful to the author for his manful effort to rescue this department of surgery from the hands of the empirics who nearly monopolize it.—*Va. Med. and Surg. Journal.*

WEST (CHARLES), M. D.,

Accoucheur to and Lecturer on Midwifery at St. Bartholomew's Hospital, Physician to the Hospital for Sick Children, &c.

LECTURES ON THE DISEASES OF INFANCY AND CHILDHOOD.

Second American, from the Second and Enlarged London edition. In one volume, octavo, extra cloth, of nearly five hundred pages. $2 00.

We take leave of Dr. West with great respect for his attainments, a due appreciation of his acute powers of observation, and a deep sense of obligation for this valuable contribution to our professional literature. His book is undoubtedly in many respects the best we possess on diseases of children. *Dublin Quarterly Journal of Medical Science.*

Dr. West has placed the profession under deep obligation by this able, thorough, and finished work upon a subject which almost daily taxes to the utmost the skill of the general practitioner. He has with singular felicity threaded his way through all the tortuous labyrinths of the difficult subject he has undertaken to elucidate, and has in many of the darkest corners left a light, which will never be extinguished.—*Nashville Medical Journal.*

BY THE SAME AUTHOR. (*Nearly Ready.*)

Publishing in the "Medical News and Library," for 1856 *and* 1857.

LECTURES ON THE DISEASES OF WOMEN. In two parts.

PART I. 8vo. of about 300 pages, comprising the DISEASES OF THE UTERUS.

PART II. (*Preparing*), will contain DISEASES OF THE OVARIES, and of all the parts connected with the UTERUS; of the BLADDER, VAGINA, AND EXTERNAL ORGANS.

The object of the author in this work is to present a complete but succinct treatise on Female Diseases, embodying the results of his experience during the last ten years at St. Bartholomew's and the Midwifery Hospitals, as well as in private practice. The characteristics which have secured to his former works so favorable a reception, cannot fail to render the present volume a standard authority on its important subject. To show the general scope of the work, an outline of the Contents of Part I. is subjoined.

Lectures I., II.—INTRODUCTORY—Symptoms—Examination of Symptoms—Modes of Examinations. *Lectures III., IV., V.*—DISORDERS OF MENSTRUATION, Amenorrhœa, Menorrhagia, Dysmenorrhœa. *Lectures VI., VII., VIII.*—INFLAMMATION OF THE UTERUS, Hypertrophy, Acute Inflammation, Chronic Inflammation, Ulceration of the Os Uteri, Cervical Leucorrhœa. *Lectures IX., X., XI., XII., XIII.*—MISPLACEMENT OF THE UTERUS, Prolapsus, Anteversion, Retroversion, Inversion. *Lectures XIV., XV., XVI., XVII.*—UTERINE TUMORS AND OUTGROWTHS, Mucous, Fibro-cellular, and Glandular Polypi, Mucous Cysts, Fibrinous Polypi, Fibrous Tumors, Fibrous Polypi, Fatty Tumors, Tubercular Diseases. *Lectures XVIII., XIX., XX.*—CANCER OF THE UTERUS.

PART II. will receive an equally extended treatment, rendering the whole an admirable text-book for the student, and a reliable work for reference by the practitioner.

BY THE SAME AUTHOR. (*Just Issued*)

AN ENQUIRY INTO THE PATHOLOGICAL IMPORTANCE OF ULCERATION OF THE OS UTERI. In one neat octavo volume, extra cloth. $1 00.

WILLIAMS (C. J. B.), M. D., F. R. S.,

Professor of Clinical Medicine in University College, London, &c.

PRINCIPLES OF MEDICINE. An Elementary View of the Causes, Nature, Treatment, Diagnosis, and Prognosis of Disease; with brief remarks on Hygienics, or the preservation of health. A new American, from the third and revised London edition. In one octavo volume, leather, of about 500 pages. $2 50. (*Now Ready*, May, 1857.)

The very recent and thorough revision which this work has enjoyed at the hands of the author has brought it so completely up to the present state of the subject that in reproducing it no additions have been found necessary. The success which the work has heretofore met shows that its importance has been appreciated, and in its present form it will be found eminently worthy a continuance of the same favor, possessing as it does the strongest claims to the attention of the medical student and practitioner, from the admirable manner in which the various inquiries in the different branches of pathology are investigated, combined and generalized by an experienced practical physician, and directly applied to the investigation and treatment of disease.

We find that the deeply-interesting matter and style of this book have so far fascinated us, that we have unconsciously hung upon its pages, not too long, indeed, for our own profit, but longer than reviewers can be permitted to indulge. We leave the further analysis to the student and practitioner. Our judgment of the work has already been sufficiently expressed. It is a judgment of almost unqualified praise. The work is not of a controversial, but of a didactic character; and as such we hail it, and recommend it for a text-book, guide, and constant companion to every practitioner and every student who wishes to extricate himself from the well-worn ruts of empiricism, and to base his practice of medicine upon principles.—*London Lancet*, Dec. 27, 1856.

A text-book to which no other in our language is comparable.—*Charleston Medical Journal.*

No work has ever achieved or maintained a more deserved reputation.—*Va. Med. and Surg. Journal.*

YOUATT (WILLIAM), V. S.

THE HORSE. A new edition, with numerous illustrations; together with a general history of the Horse; a Dissertation on the American Trotting Horse; how Trained and Jockeyed; an Account of his Remarkable Performances; and an Essay on the Ass and the Mule. By J. S. SKINNER, formerly Assistant Postmaster-General, and Editor of the Turf Register. One large octavo volume, extra cloth. $1 50.

The attention of all who keep horses is requested to this handsome and complete edition of a work which is recognized as the standard authority on all matters connected with veterinary medicine. The very low price at which it is now offered, FREE BY MAIL, places it within the reach of every one.

BY THE SAME AUTHOR.

THE DOG. Edited by E. J. LEWIS, M. D. With numerous and beautiful illustrations. In one very handsome volume, crown 8vo., crimson cloth, gilt. $1 25.